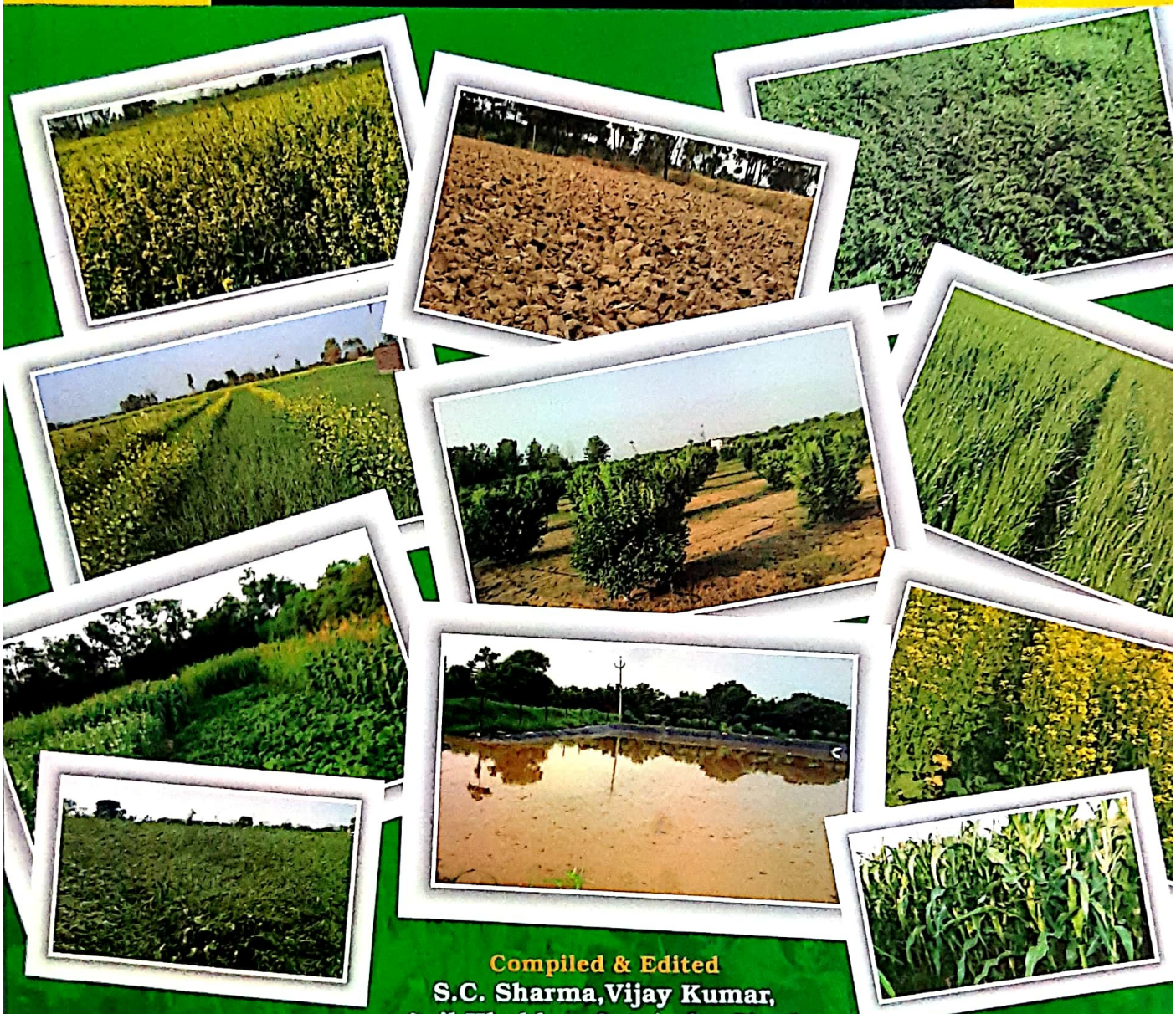
FOUR DECADES OF DRYLAND AGRICULTURAL RESEARCH IN KANDI AREA OF PUNJAB



Compiled & Edited

S.C. Sharma, Vijay Kumar,
Anil Khokhar, Satvinder Singh
and Vivek Sharma

ALL INDIA CO-ORDINATED RESEARCH PROJECT FOR DRYLAND AGRICULTURE

REGIONAL RESEARCH STATION FOR KANDI AREA
(PUNJAB AGRICULTURAL UNIVERSITY)
BALLOWAL SAUNKHRI DISTT. S.B.S. NAGAR 144 521 (PUNJAB)

2014

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Preface

DIRECTORATE OF RESEARCH
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In Punjab rainfed area lies in North-Eastern part in the form of 10 to 20 km wide strip known as 'Kandi' area. The area of region is approx. 3.93 lakh hectares which comprises approximately 7.8 per cent of total geographical area of the State. The crop production in rainfed area is mostly dependent on rainfall received during the monsoon season. The productivity of rainfed crops has remained low which is attributed to erratic distribution of rainfall, intermittent dry spells during the crop season, delayed onset and early withdrawal of monsoon.

In order to address the problems of region and develop need based location specific rainfed technologies for sustainable agriculture in the area, All India Coordinated Research Project for Dryland Agriculture (AICRPDA) at Ballowal Saunkhri was started in Hoshiarpur during 1970. Since inception, AICRPDA centre has conducted number of experiments both at station and on-farm under different themes: Rainwater management, Crops & Cropping systems, Integrated nutrient management, Energy management, Evaluation of improved varieties, Alternate land use and Integrated farming system. This publication includes the salient research achèvements of the centre from the time of inception till 2013. I am sure this publication will be useful to the scientists, extension personnel and policy makers working in the field of dryland and watershed development. I appreciate the efforts of the scientists working in AICRPDA, Ballowal Saunkhri for bringing out this valuable publication entitled "**Four Decades of Dryland Agricultural Research in Kandi area of Punjab**". I wish them all success in future research and development in this area.

18 Dec. 2014
Ludhiana

Dr Balwinder Singh
Director of Research

Acknowledgement

All India Coordinated Research Project for Dryland Agriculture (AICRPDA) was initiated in 1970 at PAU, Ludhiana campus and shifted to Ballowal Saunkhri in1990 along with an Operational Research Project on watershed approach. The project has successfully conducted several experiments since its inception to generate location specific technologies through on-station research focusing rainwater management, soil & water conservation, integrated nutrient management (INM), cropping systems, crop improvement, energy management, alternate land use and farming systems under rainfed maize-based production system of Kandi region of Punjab.

The authors/editors express their profound gratitude to Dr. B.S. Dhillon, Honorable Vice Chancellor, Dr. S.S. Gosal former Director of Research, Dr. Balwinder Singh, Director of Research, Dr. R. S. Sidhu, Director of Extension Education, Punjab Agricultural University, Ludhiana, for continuous encouragement, thought provoking suggestions, providing necessary facilities, administrative support in bringing out this publication. We are also grateful to Dr. A.K. Sikka, Deputy Director General (NRM) and Dr. B. Mohan Kumar,, Assistant Director General (agronomy and agro-forestry) ICAR, New Delhi, Dr. B. Venkateshwarlu and Dr. Ch. Srinivasa Rao, former and present Directors, CRIDA, Dr. G. Ravindra Chary, Principal Scientist, Project Coordinator unit, AICRP for Dryland Agriculture and other team members at CRIDA, Hydrabad for financial support, guidance, valuable suggestions in planning and execution of experiments.

Sincere thanks to Director, scientists & supporting staff of Regional Research Station for providing necessary assistance in execution of experiments and preparation of document. We are thankful for the co-operation and support received directly or indirectly from former Chief Scientists, scientists and supporting staff in preparation/documentation of this report in time.

December, 2014
Ballowal Saunkhri

EDITORS

1. *Salient features of Agro Ecosystem*

During seventies and eighties, dryland experiments were conducted on farmers' fields in the villages of Nawangram, Kotmajra and Jhonewal located within a distance of 10-15 km from Garhshankar in Hoshiarpur district of Punjab. The village Nawangram represented gently sloping and undulating lands in *Kandi* area which lies at the foot of the lower Shiwaliks. The latter two villages represented relatively levelled lands in the *Beet* area where soils are heavy and water retentive. During late eighties, dryland experiments were also carried out at Balachaur on the farmers' fields. In the year 1992, the dryland project was shifted at the Zonal Research Station for *Kandi* Area, Ballowal Saunkhri.

The North-Western part of the *kandi* region comprises Pathankot district and South-Eastern part comprises Eastern parts of Rupnagar and Sahibzada Ajit Singh Nagar (Ajitgarh) districts, stretching from Anandpur Sahib to Dera Bassi block having medium to heavy textured soils (Fig 1). The central part of the region covering blocks of Hoshiarpur and Shahid Bhagat Singh Nagar districts have light to medium textured soils with loamy sand and sandy loam as dominant textural classes. Most of the area drains into seasonal rivulets. Broadly, the area can be divided into various units *viz.* shoulder slopes of undulating hills, undulating piedmont and moderately sloping piedmont plains. In general, the area is excessively drained. Ground water level is very deep. Soils are believed to be the result of mainly fluviatile process i.e. filling up through by the rivers of the Indus system and formation of various land forms. The region is characterized by hyperthermic temperature with ustic moisture regime.

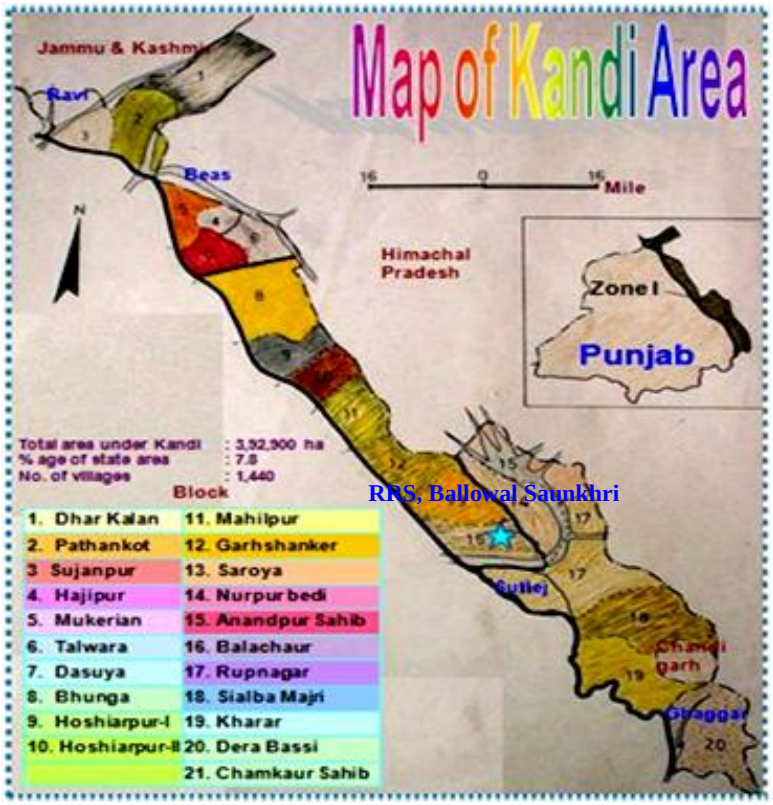


Fig. 1 Different blocks of *Kandi* region of Punjab

1.1 History of establishment of AICRPDA, Ballowal Saunkhri centre

Indian Council of Agricultural Research (ICAR), New Delhi sponsored an All India Coordinated Research Project for Dryland Agriculture in September 1970 located at Hoshiarpur under the control of Department of Soils, Punjab Agricultural University, Ludhiana with different operational stations from time to time. Presently, it is located at Ballowal Saunkhri earlier in district Hoshiarpur and since 1990 in district Shahid Bhagat Singh Nagar. Before the establishment of Zonal Research Station at Ballowal Saunkhri in 1982, project was operated in villages of district Hoshiarpur but subsequently it was shifted to Ballowal Saunkhri. The ORP centre was established in 1976.

1.2 Brief details of the Agro-climatic Zone

AICRPDA - Ballowal Saunkhri centre is situated at Regional Research Station for Kandi Area, Ballowal Saunkhri which lies in the agro-climatic Zone-I in the North-Eastern part of Punjab (NBSSLUP agro-ecological sub-region 9.1) in the form of a 10 to 20 km wide strip immediately next to Shiwalik hills known as '*Kandi*'. The area of kandi region is approx. 3.93 lakh hectares which comprises approximately 7.8 per cent of total geographical area of the State. This zone is located between $30^0 44'$ and $32^0 32'$ N latitude and $75^0 52'$ and $76^0 43'$ E longitude at an elevation of 300-500 m above mean sea level.

1.2.1 Climate

The climate of the region varies between semi-arid to sub-humid. The average maximum temperature (41°C) is recorded in first fortnight of June; whereas the minimum temperature (6 °C) is recorded in the month of January. Rainwater constitutes the major water resource and is sufficient to take two crops annually but it becomes scarce because of ill distribution in time and space. The area receives average annual rainfall of 800-1500 mm with a very high coefficient of variation. The highest rainfall is recorded in the *Dhar* block of the region. About 80% rain occurs in *kharif* season (July-September) and rest 20% occurs in *rabi* season. A major portion (30-40%) of rain goes as runoff. These rains are more uncertain at the time of sowing and drought occurs frequently, even during rainy season. The probability of expecting at least one dry spell of >6 days during individual months varies between 55 to 98%. Dry spells of longer duration also have high probability. Winter rains are received from late December to March. These rains are light and do not produce much runoff. Droughts of

variable length and frequency occur during the *rabi* season. The rainfall in June (pre-monsoon showers) is quite uncertain and often delays the *kharif* sowing, resulting in decreased yields and sometimes continuous downpour in July and August delays agricultural operations especially in heavy soils. Similarly, the time and amount of rain during withdrawal of monsoon in September are quite uncertain. Early withdrawal of monsoon is common in this region, resulting in severe drought during late part of *kharif* season. It also affects the stand establishment of subsequent *rabi* crop as upper soil layer dries up by the sowing time. Sometimes, it becomes impossible to sow a *rabi* crop on residual moisture due to inadequate soil moisture in seed zone. In such cases, farmers wait for the winter showers and sow wheat in mid-December. Underground water is generally very deep. Because of undulating and highly dissected terrains, use of underground and surface (canal) water is difficult and also expensive to exploit.

1.2.2 Soils

Majority of the soils range from loamy sand to sandy loam and have low to medium moisture retention capacity and are highly erodible. Arable lands generally belong to class II and class III of land use capability classification. These soils are deep, medium to light textured with low to good water retentive capacity having gentle to moderate slope. The inherent fertility of the soils of this area is very low. The organic carbon (<0.04%) is low and hence is highly dispersible and erodible. These are deficient in nitrogen, low (5-10 kg P_2O_5 ha^{-1}) to medium (11-20 kg P_2O_5 ha^{-1}) in available phosphorus and medium in potash (118-280 kg K_2O ha^{-1}). Marginal lands consist of torrent-affected areas, steep slopes, highly eroded soils and excessively permeable less water retentive soils. Most of these soils are non-arable and have land capability classification varying from class IV to Class VIII.

Organic carbon content averages 0.16% in the loamy sand and 0.22% in sandy loam soil. Bulk density values of the 0-180 cm layer average 1.6 and 1.5 Mg/m^3 in loamy sand and sandy loam soils respectively. Moisture retention at 1/3 bar and 15 bar suction for different layers upto 180 cm depth ranges from 8.1-15.8% and 3.7-4.8% by weight in the loamy sand and from 16.2-21.5% and 3.7-7.6% in the sandy loam soil respectively. These soils are very deep and do not have any root restricting layer. However, there is high heterogeneity in different layers of the soil profile. Loamy sand and sandy loam to clay loam are the major soils used for crop production. Soils of the area are highly erodible (K value of USLE is <0.45) and

classified as Ustifluvents, Ustipsamments and Ustocrepts. Being low in soil particle binding materials, these soils get easily dispersed under the impact of rain drops. This results in crust formation on soil surface which decreases infiltration and recharging of soil profile. Crusting impedes seedling emergence. Light rain showers of intensity as low as 10 mm/hr cause runoff in these crusting soils. The characteristics of the different soils are briefly described (Table 1).

Table 1: Soil texture, organic carbon and pH of different soil profiles

Soil depth (cm)	Horizon	Textural class	Organic carbon (%)	pH
		Pedon-1		8.2
0-22	AP	Sandy loam	0.29	8.3
22-36	AB	Sandy loam	0.20	8.3
36-53	BW1	Sandy loam	0.15	8.3
53-85	BW2	Clay loam	0.23	8.3
85-130	BW3	Silty clay loam	0.19	8.2
		Pedon-2		
0-20	AP	Loamy sand	0.18	7.9
20-38	C1	Loamy sand	0.14	8.0
38-49	C2	Loamy sand	0.15	8.0
49-120	C3	Sandy	0.09	8.1
120-140	C4	Sandy	0.11	8.1
		Pedon-3		
0-20	A1	Sandy	0.06	8.3
20-38	C1	Sandy	0.02	8.2
38-65	C2	Sandy	0.02	8.3
65-101	C3	Sandy	0.02	8.2
101-140	C4	Sandy	0.02	8.3

i) Sands

Such soils occur on sand deposits near the ‘choe’ beds. Coarse texture and uneven topography are the important limitations. The water holding capacity and fertility status of the soils is extremely low. These soils are mostly lying as waste, infested with shrubs, and put under *kharif* fodders when adequate rains are received.

ii) Loamy sand

These soils occur on slightly sloping piedmont plains. Low water holding capacity, low fertility status and susceptibility to erosion are the important limitations. Suitable soil and water

conservation measures are needed. Maize and fodder crops are grown on these soils during *kharif* and a mixture of wheat + gram or raya is grown during *rabi* when adequate moisture is available.

iii) Sandy loam – Clay loam

These soils occur on nearly level to gently sloping piedmont plains and have moderate to high water holding capacity. These have low to medium fertility status and are mostly double cropped and are main source of cereal crop production. The sloping land needs minor land shaping to improve in situ soil and water conservation. Maize-wheat/raya/taramira is the common crop rotation on these soils.

1.2.3 Crops & Cropping system

Maize is the principal crop of *Kandi* area and pearlmillet, greengram, blackgram and sesame are the other important *kharif* crops. In addition to these crops, rice and groundnut are also grown in the region in some pockets. Wheat, raya, taramira, lentil and gram are major *rabi* crops. The other emerging crops in the region are gobhi sarson, toria, African sarson, linseed, arhar. Maize-wheat and maize-wheat+raya/gram are the predominant cropping systems but maize-raya, blackgram-raya, pearlmillet-wheat cropping systems are also in practice in some areas.

1.2.4 Natural vegetation

The area which was once well covered with natural vegetation and had wide range of wild life is now ecologically degraded. Increased pressure of population and indiscriminate felling, lopping and grazing has rendered the land surface devoid of vegetation. As a consequence of loss of vegetative cover in the higher reaches, deterioration in soil quality has occurred, due to losses of nutrients and organic matter in soil erosion and this has adversely affected the productivity of the agricultural land in the lower catchments of this tract.

Agroforestry is a common farming practice in the *Kandi* tract for meeting the requirement of food, fuel and fodder and minimizing risk. In this system, perennial component of trees is integrated with regular field crops. Trees are a part and parcel of the farming system in medium rainfall alluvial soils of North-Western India. These trees help to preserve fertility and structure of the soil, utilize sub-soil water and prevent erosion. They provide additional sources of fuel, fodder and fruits and increase the overall income of the farmer. Forest trees such as kikar (*Acacia nilotica*), dhak (*Butea monosperma*), neem (*Azadirachata indica*), Albizia

sp., *Bauhinia variegata, Toona ciliata*, biul (*Grewia optiva*), tahli (*Dalbergia sissoo*), eucalyptus and poplar are grown in the area.

1.2.5 Rainfed Area Statistics of state, ACZ and domain districts of the centre

Total Area of the state (lakh ha) : 50.36

Domain Area – *kandi* region (lakh ha) : 3.93 (7.8 % of state area)

Net area sown in the domain (lakh ha) : 1.83

Irrigated area in the domain (lakh ha) : 1.24

Rainfed Area in the domain (lakh ha) : 0.59

Forest Area in the domain (lakh ha) : 0.97

1.2.6 Socio – Economic details

Landless, scheduled caste and backward classes constitute more than 50 percent of the population of this area. Traditionally, they keep large number of animal which are mostly unproductive. Farming and livestock rearing are the main occupations of the people. Some of the male members of the family seasonally migrate to other regions to earn their livelihood. They usually work as helpers/labourers for weighing, loading and unloading grains in grain markets at the cost of their own farming and farm work is usually handled by women, children and elderly persons at home.

Wild animals/stray cattle are a big menace to the crops from sowing to harvesting, particularly in areas adjoining the forest and barren lands. Further, insects such as termites, aphids and caterpillars cause considerable damage to the crops. Farming as profession even with land holders is a subsidiary occupation, about 40% of them work at their farms and others go to cities for earning their livelihood.

People of the area are generally economically backward, less educated and tradition bound. They are less conversant with the improved technologies. The land holdings are small, fragmented and are generally degraded and poor in productivity. Majority of the farmers in this region are having holding of <2 ha which exist in small fragmented pieces. The farmers' investment capacity is very low. In general, farmers are not able to use recommended inputs needed for high production viz., fertilizer, insecticides, pesticides and weedicides and improved seeds because of (i) uncertainty about the return due to crop failure (erratic rainfall), (ii) weak economic condition and (iii) lack of awareness about improved technologies (extension gaps).

2. Climate Trends

2.1 Rainfall

The normal rainfall of this region is 1081 mm, out of which 80% is received during the monsoon period coinciding with *kharif* season. Out of the remaining 20% rainfall, roughly 15% occurs during the *rabi* season and 5% during the off season when there are no crops (Fig 4 & 5. The highest rainfall is received during the month of July and Aug and lowest during the months of November.

Rainfall	Normal Rainfall (mm)	Normal Rainy days (no)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
SW monsoon (June-Sep)	864	35	1st July	4th week of September
NE Monsoon (Oct-Dec)	60	3	-	-
Winter (Jan- Feb)	70	5	-	-
Summer (March-May)	80	8	-	-

The highest rainfall was received during 1988, whereas it was lowest during 2009. The decade-wise rainfall pattern reveals that the rainfall during the 80s and 90s was almost similar; while it dropped drastically during the last decade i.e. during 2001-2010 the average rainfall was only 883 mm which is 21.5 per cent deficit than the normal. The number of rainy days during the last decade are also lowest than the earlier two decades i.e. there is significant declining trend in number of rainy days.

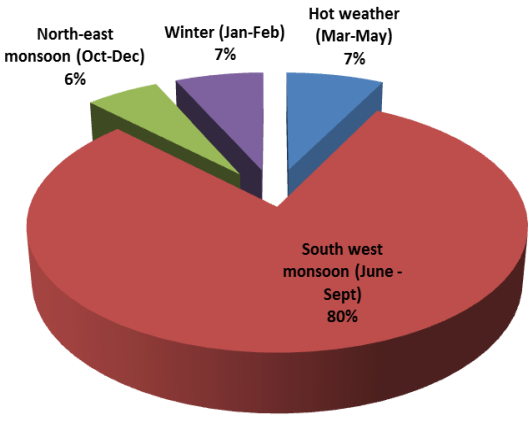


Fig 2: Seasonal Rainfall distribution at AICRPDA – Ballowal Saunkhri (1984-2010)

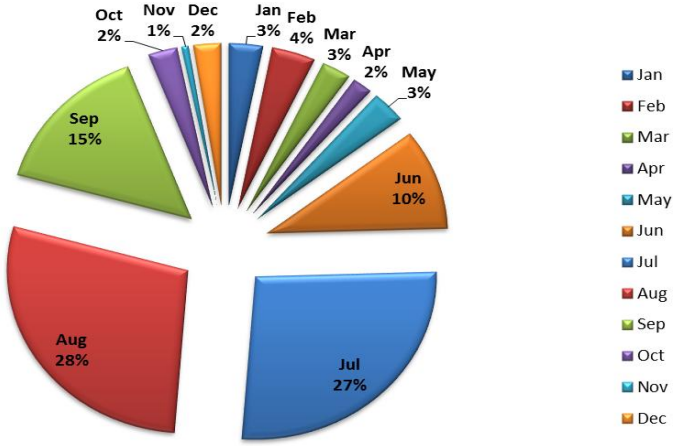
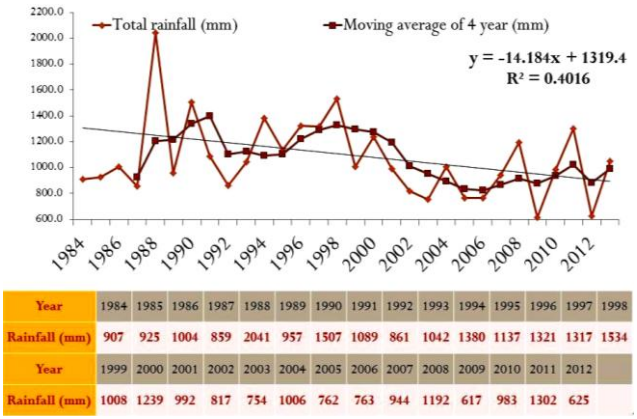


Fig 3: Mean Monthly Rainfall distribution at AICRPDA – Ballowal Saunkhri (1984-2010)



Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Rainfall (mm)	907	925	1004	859	2041	957	1507	1089	861	1042	1380	1137	1321	1317	1534
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Rainfall (mm)	1008	1239	992	817	754	1006	762	763	944	1192	617	983	1302	625	

Fig 4: Annual rainfall pattern at AICRPDA – Ballowal Saunkhri (1984-2012)

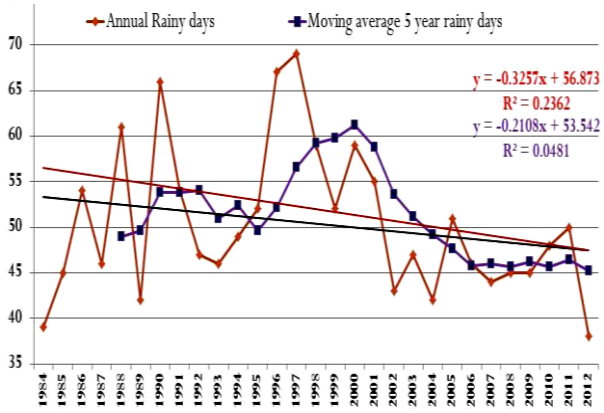


Fig 5: Annual number of rainy days at AICRPDA – Ballowal Saunkhri (1984-2012)

2.2 Temperature – Minimum, Maximum – Weekly, Monthly and Crop seasonal

The maximum temperature was highest in the pre-monsoon season and lowest in the winter season, while minimum temperature was highest in the monsoon months. Highest annual mean temperature was recorded in the year 1999, whereas it was lowest in 1992 making it the coldest year. The decade wise temperature study revealed that during the 80s and 90s the maximum temperature was similar; however there is rise in the temperature during the last decade (2001-2010) and it is to the tune of 0.7^0C over the last two decades (Fig 6). The scenario is different in case of minimum temperature, where the temperature decreased during the 90s (1.1^0C) and then there was again increase in the temperature in the last decade (0.8^0C) over the previous decade. The rise in temperature is more from February to June than the rest of the months (Fig 7).

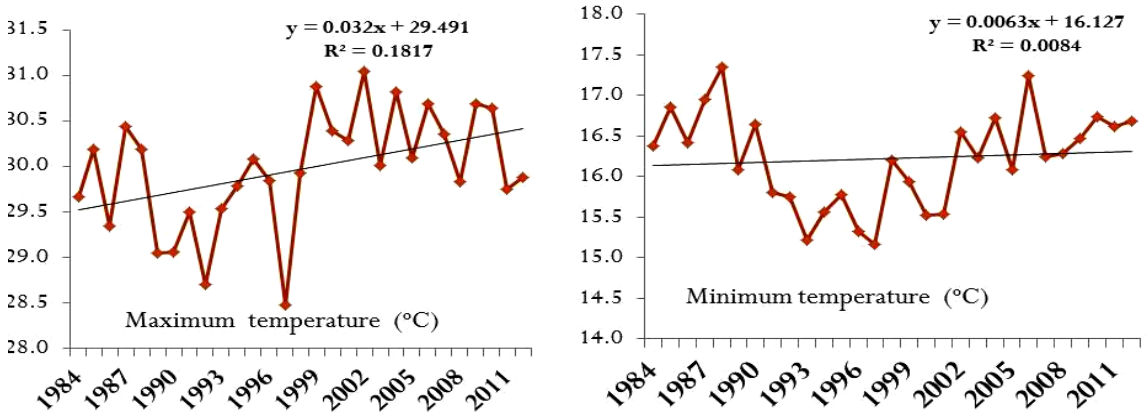


Fig 6: Variation in average annual maximum and minimum temperature at AICRPDA – Ballowal Saunkhri (1984-2012)

2.3 Wind velocity

The perusal of the data revealed that the wind velocity over the years was highest from April to June and it declined i.e. was minimum during the monsoon season. The average wind velocity was highest during the year 1988 and onwards it is on the decline. The average decade-wise wind velocity is also on the decline, during 1980s it was highest i.e. 4.9 km/hr. and lowest 2.9 km/hr in 2Ks (Fig 8).

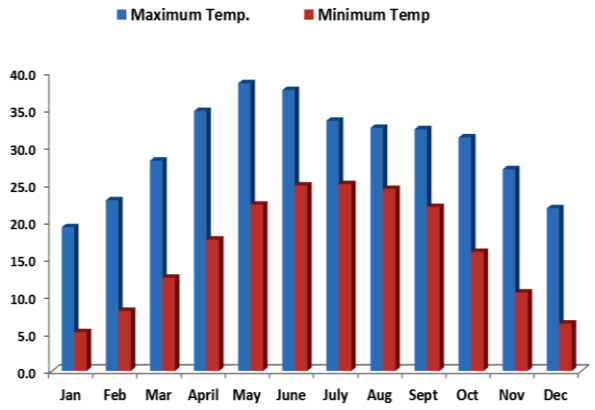


Fig 7: Average monthly temperature (max. & Min.) at AICRPDA – Ballowal Saunkhri (1984-2010)

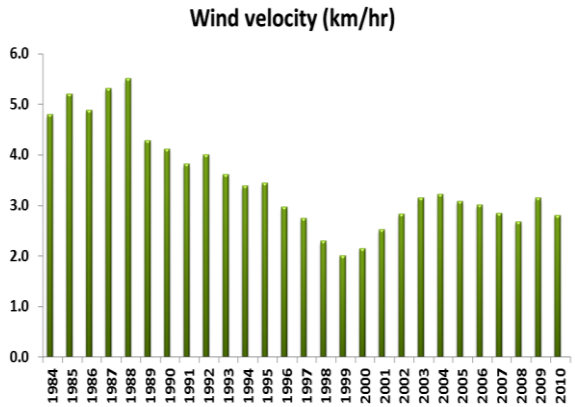


Fig 8: Average annual wind velocity at AICRPDA – Ballowal Saunkhri (1984-2010)

2.4 Relative humidity

The average relative humidity is minimum in the month of April and May; however it is maximum from July to September because of the rainy season (Fig 9). The mean average relative humidity (%) during 1990s increased over the 1980s, while it again declined in 2ks which can be attributed to the drastic reduction in the rainfall during the last decade (Fig 10).

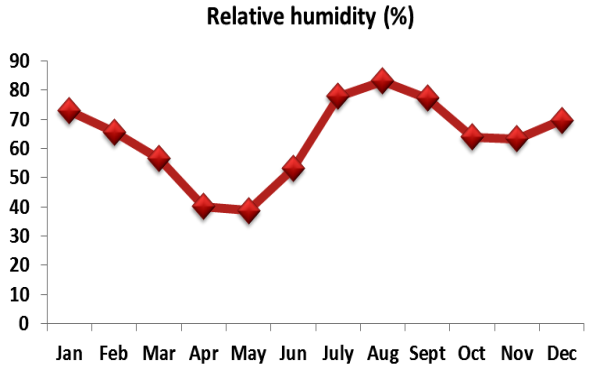


Fig 9: Average monthly relative humidity at AICRPDA – Ballowal Saunkhri (1984-2010)

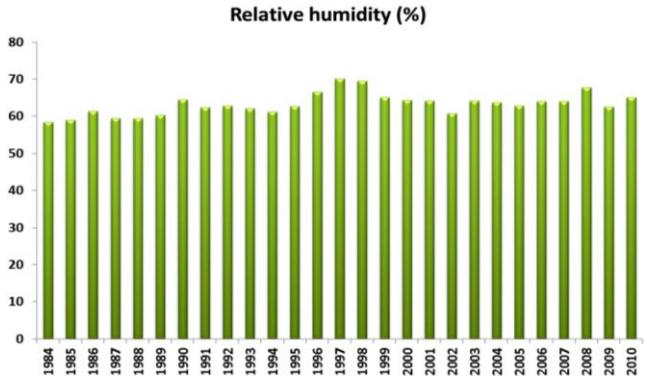


Fig 10: Average annual relative humidity at AICRPDA – Ballowal Saunkhri (1984-2010)

2.5 Sunshine hours

The study of the sunshine hours over the years reveals that the sunshine hours are highest from April to June mainly due to clear sky and longer day lengths and minimum during July-August & January due to cloudy weather in the monsoon months and dense fog in the month of January as this region is situated in the foothills of shiwalik ranges and more prone to fog (Fig 11). The decade-wise perusal of the average data revealed that the mean sunshine hours are also on the decline (Fig 12).

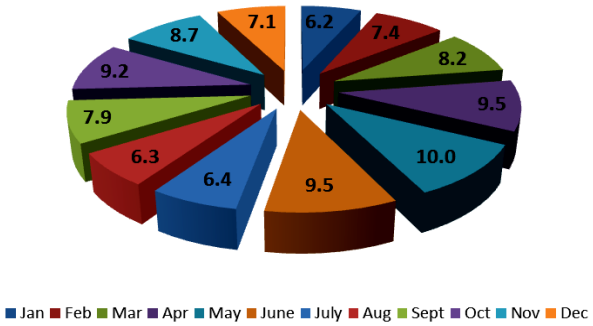


Fig 11: Average monthly sunshine hours at AICRPDA – Ballowal Saunkhri (1984-2010)

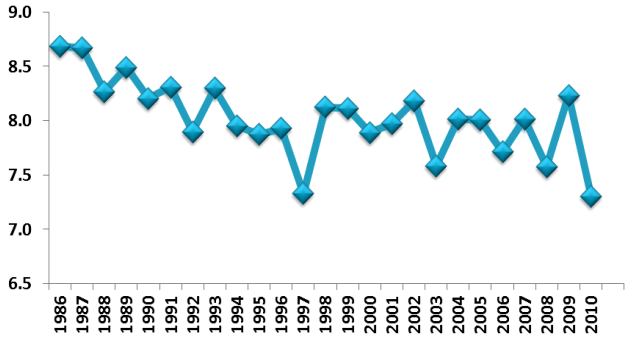


Fig 12: Average annaul sunshine hours at AICRPDA – Ballowal Saunkhri (1984-2010)

2.6 Pan evaporation

The average maximum evaporation was recorded in month of May which can be attributed to the high temperatures in this month, whereas it was lowest in the month of December and January due to low temperatures. The look at the larger picture i.e. decade-wise reveals that evaporation is also declining over the decades and it can be attributed mainly to the decrease in rainfall over the decades.

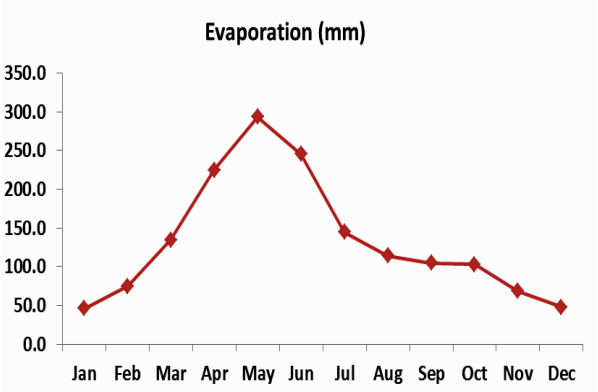


Fig 13: Average monthly pan evaporation (mm) at AICRPDA – Ballowal Saunkhri (1984-2010)

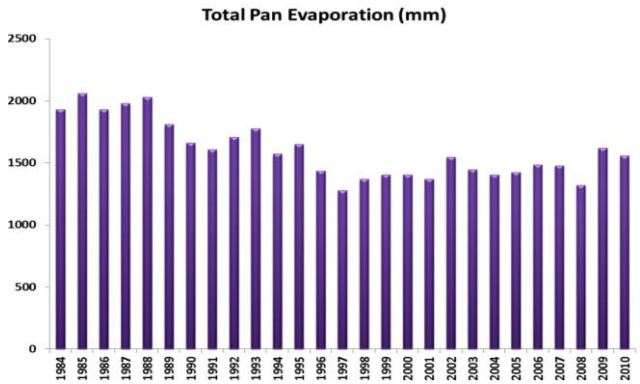


Fig 14: Average annual pan evaporation (mm) at AICRPDA – Ballowal Saunkhri (1984-2010)

3. Experiments at the Centre

3.1 No. of experiments conducted theme-wise (RWM, CS, INM, EM, PVS, ALU, IFS and others) since beginning of the centre

Themewise number of experiments conducted to address the problems of region and to develop need based and location specific rainfed agriculture technologies for sustainable agriculture in the area.

Table 2: Theme wise experiments conducted since the inception of the AICRPDA centre

S.No.	Theme	No. of experiments conducted
1	Rainwater management	38
2	Integrated nutrient management	79
3	Energy management	5
4	Crops & Cropping system	63
5	Evaluation of Improved Varieties	19
6	Alternate land use	3
7	Integrated farming system	2

3.2 Research trends at the centre

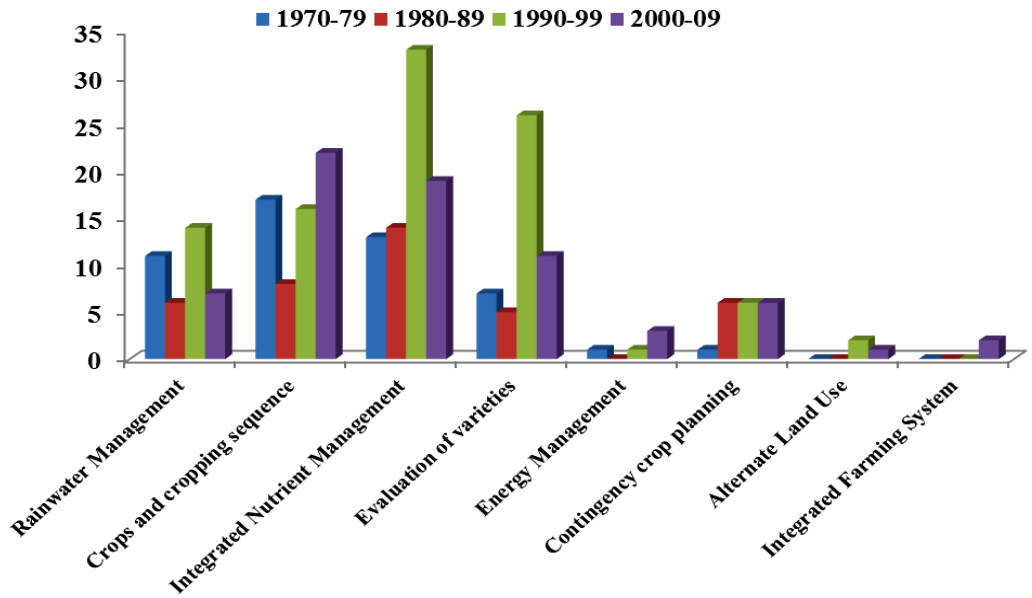


Fig 15: Theme wise experiments conducted at the center

4. Salient Research Achievements

4.1 Rainwater Management

4.1.1 *In situ* moisture conservation

To increase the moisture availability to the agricultural crops, it is necessary to adopt in-situ moisture conservation techniques in addition to the large scale soil and moisture conservation and water harvesting structures in the watershed. The principle behind the recommendation of different practices is to increase the infiltration by reducing the rate of runoff, temporarily impounding the water on the surface of the soil to increase the opportunity time for infiltration and modifying the land configuration for inter plot water harvesting.

4.1.1.2 Minor land shaping

The cultivation of crops on slopes without modifying them produces higher runoff, lesser infiltration of water and more erosion but when original ground slopes are modified on contour bunds/terraces and bench terraces, runoff and soil erosion can be controlled. These land treatment measures increase infiltration and soil water storage.


Land Levelling

Almost whole of the arable land is divided into number of small fields by putting small bunds. The field shape, degree and length of slope vary to a great extent from place to place. Formation of bunds is an accepted method to facilitate infiltration and percolation of rain water to help soil and ground water recharge in addition to avoid runoff that results in erosion of top soil. Small holdings of the farmers and agricultural practices followed in the foothills of Shiwaliks warrant narrow-based bunds on adjusted contours taking field boundaries and direction of slope into consideration. Minor land shaping helps increase soil water storage in two ways:

i) Infiltration of water into the soil causes less runoff and hence reduces soil erosion.

ii) More soil water storage sustains the crop for a longer period without rain.

Studies were conducted in the operational research project at village Boothgarh during 1976-77 on minor land shaping on the sloping lands. It was shown that leveling of the individual fields with minimum cut and fill was effective to control erosion and increase water

conservation. Each field was provided with a suitable outlet for drainage of surplus water. The fields were bunded all around and level of the outlet structure was kept a few cm above the surface of the field. This allowed more opportunity time for percolation of water into the soil and excess water leaving the field was free from sediment. Pre-fabricated drop structures were found suitable and economical for small fields having a drop of <50 cm and a drainage area up to 0.5 ha. For bigger fields with large elevation drop between fields, brick masonry structures were necessary. Runoff water from one field was led to another and ultimately drained into main drain. Grassed waterways were provided at appropriate places where common land was available. Wherever the field size was big and had higher slope, it was divided into two terraces and leveled separately. With the participation of farmers, an area of 25 ha catchment was treated on watershed basis during 1976-77 at village Boothgarh. Result indicated that yield of wheat + gram mixture and bajra fodder increased considerably due to these treatments.

4.1.1.3 Tillage practices for enhancing the rain-water intake

Tillage in the rainfed areas is done for increasing and conserving soil moisture, controlling weeds and preparation of seed-bed.

i) Pre-monsoon ploughing


Summer Ploughing

This practice includes ploughing of fields about a month before the onset of monsoon rains which makes the field surface rough and clody. This practice improves infiltration of rainwater into the soil by providing more opportunity time, reduces runoff and soil erosion. The effect of deep tillage on soil moisture conservation and crop yield was studied for several years on varying soil types. The response to tillage was strongly linked with the amount and distribution of rainfall. When the monsoon withdrew early causing moisture stress deep ploughing caused significant favourable effect on soil moisture and increased considerably the yield of maize as well as the following wheat crop (Table 3). However, in years of more favourable rainfall throughout the crop season, tillage treatments did not influence the yield. On the other hand, with excessive rains during the crop season, maize yields with deep ploughing were lower than with conventional tillage on heavy textured soils.

Table 3: Effect of deep tillage during *Kharif* on grain yield (q/ha) in maize-wheat Sequence

Year	Maize yield		Wheat yield	
	Conventional tillage	Deep tillage	Conventional tillage	Deep tillage
1973-74	19.60	22.50	24.50	24.70
1974-75	19.50	24.30	6.30	13.00
1976-77	22.10	40.60	38.70	-
1991-92	11.10	13.70	-	-
1993-94	6.20	8.90	-	-
1994-95	19.13	28.62	-	-
1995-96	11.97	16.59	13.7	17.15
1996-97	31.11	41.58	21.57	27.05

ii) Post-sowing tillage

Post-sowing tillage operations during *kharif* either as hoeing or inter-culturing (haloding) help in pulverizing the rhizosphere for increasing water intake and also for controlling weeds. Haloding is an important practice in maize cultivation and involves ploughing with a *desi* plough between the inter-row spaces in a month old crop. This practice checks weeds, does earthing-up and create shallow ditches between the rows. The ditches when produced against slope or on flat surface intercept and detain runoff water and help store more water. Haloding helps in creating soil mulch that blocks pores and checks evaporation losses of soil moisture. In addition, the earthing up supports the plants, aerates the rooting zone and decreases resistance to growing roots, thereby creating conditions for better plant growth.

Traditional Method

Haloding with Tarctor

The effect of varying post-sowing tillage operations including haloding was studied on standing maize crop. Hand hoeing with 'khurpa' at 20 days after sowing and interculturing with bullock-drawn country plough (haloding) at 35 days after sowing increased yield of maize significantly (Table 4) over control. These operations helped the crop by checking the weeds and increasing water intake into the soil.

Table 4: Effect of post-sowing tillage operations on maize yield and residual soil moisture

Year	Maize (q/ha)			Residual soil moisture (cm/180 cm)		
	Control	Hoeing	Haloding	Control	Hoeing	Haloding
1975	26.00	35.50	36.50	26.6	30.5	28.9
1976	17.10	19.50	23.90	43.5	44.8	43.7
1994	18.58	24.33	28.00			

iii) Post-harvest tillage

This practice consists of repeated shallow tillage followed by planking immediately after harvesting of the *kharif* crop. Preferably, the field is ploughed in the evening and planked next morning to conserve dew drops fallen at night. Locally this practice is called as '*Gil dabna*', meaning conservation of the moisture. This practice is significantly sound. By ploughing at the first opportunity, the profile water is conserved by checking upward movement of water through breaking the continuity of capillaries towards the soil surface. This practice assumes greater significance in dryland areas where wheat is sown during the drier months of October-November and germination depends on residual profile moisture.

In order to effectively conserve the available moisture at the maturity of maize crop, experiment was conducted with the following treatments to check the evaporation losses i.e. field preparation by ploughing and planking at physiological maturity, at actual maturity and at 10,20 and 30 days after actual maturity. Sowing of wheat was done on same date in all the treatments. Results revealed that there was a significant decrease in wheat yield with delay in conservation of soil moisture (Table 5). This was due to the fact that the moisture content in the soil profile at the time of wheat sowing decreased drastically when ploughing and planking operations of the field after maize harvest were delayed. Therefore, soil profile moisture

conservation immediately after harvest of maize was important to get better yields of the following crop (wheat) under rainfed conditions.

Table 5: Effect of different periods of moisture conservation after harvest of maize on profile moisture and wheat yield

Year	Moisture conservation at				
	Physiological maturity of maize	**Actual maturity**	**10 days after actual maturity**	**20 days after actual maturity**	**30 days after actual maturity**
	Soil profile moisture at wheat sowing				
	(cm/180 cm depth)				
1992-93	24.8	24.0	21.7	19.5	16.1
1993-94	30.5	28.3	26.7	22.6	20.3
1994-95	25.3	23.9	19.7	17.5	14.0
1995-96	17.8	16.0	14.5	13.5	11.5
	Wheat yield (q/ha)				
1992-93	28.00	26.20	22.57	20.15	17.62
1993-94	26.00	23.00	19.37	14.16	13.37
1994-95	33.00	30.25	25.00	18.25	15.75
1995-96	18.32	18.16	14.16	13.66	12.60
1996-97	41.18	38.69	37.36	36.50	35.05

4.1.1.4 Mulching

Mulch cover protects the soil from the impact of rain drops and reduces the velocity of runoff and wind. Organic mulch of crop residues is known to increase soil moisture storage and maintain higher water content in the upper soil layer. Organic mulching also decreases soil temperature by providing shade. However, the residue may also pose some problems when tillage tools get clogged with the residue and also termite infestation increases manifold on mulched fields. Despite these drawbacks, the effectiveness of mulching in yield increase, reducing erosion and increasing residual profile water has been amply demonstrated.

In *Kandi* area, the *rabi* crops are grown on moisture stored after fallow or on residual moisture left in the profile after harvesting the preceding *kharif* crops. There is relatively little

rainfall during the initial growing season of the *rabi* crop and early withdrawal of monsoon results in drying out the upper soil layers comprising the seed zone. The total amount of residual or stored moisture in the profile and moisture in the seed zone is particularly critical when wheat is sown after a *kharif* crop. Therefore, to ensure proper germination of the *rabi* crop, it is necessary to conserve adequate moisture in the seed zone.

The results of mulching in maize-wheat sequence and in sugarcane are described below:

i) Maize-wheat sequence

a) Brought-in mulch

Field experiments were conducted for several years on varying soil types on the effect of mulching applied at the rate of 4 t/ha with locally available wild shrubs viz. basooti (*Adhatoda vasica*), Bhang (*Cannabis sativa*), Kana (*Sachharum munja*), Raya stalks (*Brassica juncea*), Nara (*Arundodonax* spp.) and subabul (*Leucaena* sp.) in standing maize during last week of August. The effect of mulch on maize yield and residual effect was studied on the following wheat crop.

The results indicated variable increases in yields of maize and following wheat crop depending on the moisture conserved and rainfall pattern during the crop season (Table 6). The increase in wheat yield with mulching in the preceding crop of maize was ascribed to greater residual soil moisture after maize, particularly in the seed zone and enrichment of soil nutrients. Response to mulching was greater during the low rainfall years than in high rainfall years. Water utilization by wheat from the profile was generally better in mulched plot as compared to unmulched crop. The different studies revealed that basooti, nara and kanna (Table 7 & 8) are the best locally available material which can be used as mulch in standing maize crop.

Basooti is rich in plant nutrients, containing 3.4% N, 0.4% P and 3.75% K. The yield of wheat with application of 40 kg N/ha in plots where mulching was done in previous maize crop was comparable with 80 kg N/ha in the unmulching plots. It indicated that mulching saved fertilizer to the extent of 40 kg N/ha in wheat crop.

It was concluded that application of organic mulch of green wild growing vegetation in the last week of August was an effective in situ moisture conservation practice, benefiting the standing crop of maize as well as the following wheat.

Table 6: Effect of mulching in maize on yield performance (q/ha) on maize-wheat sequence

Year	No mulching		Mulching		Rainfall (mm)	
	Maize yield	Wheat yield	Maize yield	Wheat yield	*Kharif*	*Rabi*
1973-74	31.9	20.8	34.3	24.3	978	62
1974-75	10.0	10.3	14.4	11.3	518	112
1975-76	25.6	26.0	30.3	21.5	902	155
1977-78	20.9	34.0	23.7	39.4	759	174
1978-79	27.0	29.7	29.5	37.3	1005	226
1979-80	10.3	9.4	10.7	15.2	583	101
1980-81	23.8	31.3	27.5	36.1	662	346
1981-82	14.1	22.9	15.8	35.5	355	409
1982-83	16.9	26.5	19.6	33.0	441	334
1983-84	38.7	23.0	37.5	33.1	599	149
1984-85	30.8	21.1	42.0	30.0	672	25
1985-86	34.9	32.1	40.7	40.5	785	155
Mean	**23.7**	**23.9**	**27.2**	**29.8**	**688**	**187**

b) In-situ raised mulch

Results of several years have conclusively established the beneficial effect of brought-in mulch in improving the crop productivity of maize-wheat sequence, particularly in low rainfall years. However, due to the limited availability of vegetative mulch material and labour involved, mulching practice could not get popularized among farming community at large scale. To solve this problem, experiments were conducted on *in-situ* raised mulch by growing green manure crop of sunhemp or cowpea in between the furrows of maize. Green manure crop was cut at an age of one month and spread in between the maize rows.

Table 7: Effect of crop residue management practices on crop growth and yield in maize-wheat/raya/lentil cropping sequence

S.No.	Treatment	Grain (kg/ha)					
		2005-06	2006-07	2007-08	Mean	Mean BC ratio	RWUE (%)
Maize							
1	Control	2811	1904	1036	1917	0.58	3.26
2	Paddy straw	-	3316	1519	2418	1.18	5.30
3	Hoeing	-	2677	1327	2002	0.95	4.41
4	Basooti	3323	2245	1209	2259	0.74	3.82
5	Subabul	3869	2482	1192	2514	0.82	4.04
6	Sugarcane	4058	3351	1643	3017	1.23	5.50
	Mean	**3515**	**2663**	**1321**	**2355**	**0.92**	**4.39**
	CD (0.05)	658	575	281			
Wheat							
1	Control	117	1960	620	899	0.76	5.81
2	Paddy straw	-	2910	1208	2059	1.49	9.99
3	Hoeing	-	1990	861	1426	0.92	6.61
4	Basooti	117	2190	801	1036	0.96	6.19
5	Subabul	129	2480	771	1127	1.07	6.46
6	Sugarcane	124	2630	952	1235	1.23	9.45
	Mean	**122**	**2360**	**869**	**1297**	**1.07**	**7.42**
	CD (0.05)	NS	470	301			
African Sarson							
1	Control	30	1290	209	510	0.96	5.32
2	Paddy straw	-	1740	387	1064	1.46	5.65
3	Hoeing	-	1270	257	764	0.98	6.50
4	Basooti	26	1470	245	580	1.13	4.25
5	Subabul	38	1550	296	628	1.25	7.29
6	Sugarcane	12	1580	384	659	1.32	4.16
	Mean	**27**	**1483**	**296**	**701**	**1.18**	**5.53**
	CD (0.05)	NS	250	71			
Lentil							
1	Control	-	910	57	484	1.01	2.46
2	Paddy straw	-	1190	102	646	1.48	1.87
3	Hoeing	-	930	117	524	1.14	1.44
4	Basooti	-	950	102	526	1.13	1.51
5	Subabul	-	1040	117	579	1.30	2.01
6	Sugarcane	-	1090	111	601	1.35	1.92
	Mean	-	**1018**	**101**	**560**	**1.23**	**1.87**
	CD (0.05)	-	140	36	-	-	

Table 8: Effcet of locally available material for mulching on yield of maize and wheat.

S.No.	Treatment	Grain (kg/ha)							
		2008-09	2009-10	2010-11	2011-12	2012-13	Mean	Mean BC ratio	RWUE (%)
Maize									
1	Control	1113.0	759.0	2801	1684	1296	1531	1.30	3.07
2	Kanna	1545	974	3666	1960	1774	1984	1.45	4.00
3	Hoeing	1651	1154	3750	2093	2021	2134	1.65	4.31
4	Raya stalks	1577	911	3383	1938	1702	1902	1.36	3.81
5	Subabul	1607	1068	3207	1899	1611	1878	1.35	3.72
6	Nara	1240	838	4027	2018	2065	2038	1.53	4.26
	CD (0.05)	312	160	382	138	173			
Wheat									
1	Control	1791	333	1204	706	1359	1079	1.10	6.63
2	Kanna	2039	449	1448	874	1833	1329	1.35	7.97
3	Hoeing	2097	481	1497	903	1731	1342	1.36	8.10
4	Raya stalks	1931	403	1356	811	1528	1206	1.23	6.91
5	Subabul	2276	464	1473	793	1602	1322	1.32	7.74
6	Nara	2168	387	1328	846	1644	1275	1.28	7.95
	CD (0.05)	240	62	NS	68	134			

Results indicated that *in-situ* raised mulch increased maize yield significantly over no mulch treatment. The effect of brought-in mulch of basooti and in-situ raised mulch of sunhemp on maize yield was comparable (Table 9). Further, the residual effect of *in-situ* raised mulch on wheat yield was also significant due to increased conservation of moisture in the soil profile.

Table 9: Response of maize to brought-in and in-situ grown mulch with sunhemp

Year	Maize yield (q/ha)		
	No mulch	Brought-in mulch	In-situ grown mulch
1993	9.18	11.76	11.80
1994	23.66	25.00	30.75
1995	17.48	22.62	21.69
1996	28.89	33.71	32.16
Mean	**19.8**	**23.30**	**24.10**

ii) Sugarcane

In the 'beet' area of *Kandi* region of Punjab, sugarcane is grown on medium to heavy textured soils with good water holding capacity. Sugarcane is preferred to maize and wheat in some areas because it is more remunerative and tolerant to both dry and wet soil conditions. The crop is planted in the month of March and experiences hot and dry summer in April, May and June. The survival and growth of plants depends exclusively upon soil profile moisture.

Hoeing followed by compaction and mulching is a common practice for raising sugarcane under rainfed conditions. When the plants are about 10 cm high, inter-row hoeing is done followed by beating the loosened clods with a wooden log to break the clods and to compact the surface soil layer. Compaction facilities sub-soil moisture movement to the surface soil layer by reducing size of soil capillary pores and creating their continuity with that of the deeper soil layer. This practice helps sugarcane to establish during the initial stages of growth. The compacted surface is mulched with available organic residues which help in checking evaporation of moisture from the soil surface and also in maintaining favourable soil temperature regime.

Experiments were conducted to study the effect of mulch application for conserving soil profile moisture on yield of sugarcane. Results showed a significant increase in cane yield with application of 4 t/ha vegetative mulch during the month of April (Table 10). The profile moisture recorded before the onset of monsoon was higher in mulched plots. Further, soil temperature recorded during summer months was also lower in mulched sugarcane plots.

Table 10: Effect of mulching on yield of sugarcane and soil temperature

Year	Yield (q/ha)		Mean soil temp.(oC) during May-June	
	No mulch	Mulching	No mulch	Mulching
1974	373	460	37.0	32.9
1975	354	566	45.6	40.1
1993	494	728	-	
1997	373	486		
1998	384	501		
1999	366	500		
Mean	**391**	**540**	**41.3**	**36.5**

4.1.1.5 Cultivation across the slope

The soils of the *Kandi* area are generally undulating with varying degree of slope. Cultivation across the slope reduces the velocity of rain water, checks loss of soil and sediment caused by erosion and allows more time for water to infiltrate into the soil profile.

4.1.1.6 Vegetative barriers

Suitable grasses and bushes raised on field boundaries across the slope are the alternatives to bunding on arable lands to increases soil profile storage and reduce soil erosion. These barriers when established on contours are cheap and quite effective. Planting of vegetative barriers is done during the rainy season and they take two to three years to become effective.

Vegetative Barrier

The effectiveness of different vegetative barriers, such as vetiver grass (*Vetiveria zizanoides*), kanna grass (*Saccharum munja*), babbar grass (*Eulaliopsis binata*) and napier hybrid bajra (*Pennisetum purpureum x typhoides*) was tested when planted across the slope on field boundaries for in situ soil and moisture conservation. The runoff amount and sediment yield by the vegetative barriers were reduced significantly compared with control (Table 11 & 12). These barriers also helped in natural leveling of the land. The yields of maize and wheat were higher in plots on which vegetative barriers were planted than control. The plots with vegetative barriers conserved 2-4 cm/100 cm depth more soil profile moisture. Experiments conducted to evaluate biomass production by above grasses raised for erosion control indicated that during early years, the growth of napier- bajra hybrid was highest but in the subsequent years, Kanna stabilized its growth and gave highest biomass.

Table 11: Influence of vegetative barriers on yield and economics of *kharif* crops over the years

Treatments	Grain yield (kg/ha)	Stalk yield (kg/ha)	Water Use Efficiency (kg/ha/mm)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Maize							
Control	2150	5742	3.60	16744	27071	10327	1.50
NH Bajra	2733	7079	4.61	17468	34048	16581	1.82
Vetiver	2565	6677	4.32	17408	32049	14641	1.72
Babbar	2571	6698	4.32	17429	32245	14816	1.72
Kannah	2769	7183	4.67	17471	34484	17013	1.85
Subabul	2422	6344	4.07	17359	30313	12954	1.63
Mean	**2535**	**6621**	**4.27**	**17313**	**31702**	**14388**	**1.71**
Rainfall (mm)	586.7						
Sesamum							
Control	365	2848	0.70	11517	16567	5050	1.45
NH Bajra	432	3219	0.83	11918	19577	7659	1.65
Vetiver	429	3148	0.82	11918	19390	7472	1.64
Babbar	429	3096	0.82	11918	19376	7458	1.64
Kannah	451	3453	0.87	11918	20382	8464	1.72
Subabul	430	3209	0.83	11918	19370	7452	1.64
Mean	**423**	**3162**	**0.71**	**11851**	**19110**	**7259**	**1.62**
Rainfall (mm)	565.1						
Blackgram							
Control	598	2188	1.09	14091	22419	8328	1.58
NH Bajra	723	2528	1.32	14619	26919	12300	1.83
Vetiver	726	2576	1.32	14619	27012	12393	1.85
Babbar	719	2548	1.31	14619	26840	12221	1.83
Kannah	757	2712	1.38	14619	28151	13532	1.92
Subabul	672	2403	1.22	14619	25234	10615	1.71
Mean	**699**	**2493**	**1.28**	**14531**	**26096**	**11565**	**1.79**
Rainfall (mm)	577.8						

Table 12: Influence of vegetative barriers on yield and economics of *rabi* crops over the years

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Water Use Efficiency (kg/ha/mm)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Wheat							
Control	2486	5086	14.54	14463	40747	26284	2.84
NH Bajra	2081	4175	11.80	14899	34087	19188	2.30
Vetiver	2035	4175	13.26	14914	33720	18805	2.26
Babbar	2143	4328	14.21	14905	35154	20249	2.37
Kannah	1986	4025	11.71	14892	32760	17868	2.20
Subabul	2086	4340	10.86	14928	34748	19819	2.32
Mean	**2136**	**4355**	**12.73**	**14834**	**35203**	**20369**	**2.38**
Rainfall (mm)	130						
Raya*							
Control	1099	3690	5.83	6782	26379	19596	2.63
NH Bajra	1315	4788	8.43	11061	33219	22158	3.10
Vetiver	1248	4606	6.63	11317	31527	20210	2.89
Babbar	1247	4452	6.59	11317	31531	20215	2.88
Kannah	1298	4527	6.61	11317	32779	21463	3.02
Subabul	1283	4642	5.94	11317	32339	21022	2.97
Mean	**1299**	**4700**	**7.17**	**11277**	**32791**	**21514**	**3.02**
Rainfall (mm)	108						
Lentil							
Control	601	1439	2.53	9260	21856	12596	1.65
NH Bajra	661	1702	2.50	9437	25011	15574	1.86
Vetiver	714	1741	4.08	13295	27708	14412	2.01
Babbar	812	2039	4.52	13487	31560	18073	2.28
Kannah	746	1807	3.71	13487	29113	15626	2.08
Subabul	760	1832	4.46	13487	29629	16142	2.13
Mean	**750**	**1837**	**4.02**	**13457**	**29187**	**15730**	**2.11**
Rainfall (mm)	91						

4.1.1.7 *In-situ* rain water harvesting and moisture conservation technologies in plantation

The V-ditch and crescent bund methods of planting for horticultural and forestry plants on sloppy land harvest maximum *in-situ* rainwater as compared to the traditional pit method. In case of guava after two years of plantation highest survival was observed in V-ditch (60%) followed by crescent bund (40%) and least in pit (28%). The linear regression equations for growth with time as an independent variable are as follows:

V-ditch : Hv= 31.5 + 1.16 X (R^2=+0.97)

Crescent bund : Hc= 40.1 + 0.84 X (R^2=+0.96)

Traditional Pit : Hp= 33.9 + 0.85 X (R^2=+0.88)

On clayey soil the plants should be placed on the upper side of the ditch to avoid the water logging conditions whereas in soils with good water infilterability, plants should be in the ditch.

V- ditch Method of Plantation

Higher success rate of plantation was attained by planting trees in V-ditches. On clay soil, the plant should be placed on the upper side of the ditch to avoid waterlogging conditions, whereas, in soils with good water infiltration, plants should be placed in the ditch. Trenching around Amla (*Emblica officianalis*) plants conserved 350-400 litres of runoff water per trench.

4.1.2 *Ex-situ* moisture conservation

Despite moisture conservation measures, the water stress does occur during long rainless periods even during the monsoon season. Often the monsoon recede early and winter rains are delayed, with the result the *rabi* crops are not sown in time. Because of the rolling topography, much of the monsoon rain is lost as runoff through the mesh gullies. It is estimated that 25-45% of the monsoon rain is lost as runoff in the area, depending on soil type and topography of land. This runoff water, if harvested, in excavated or impounding type reservoirs, can be effectively used for the purpose of irrigating the crop and for use by animals as well as

pisciculture. It has been observed that even after enhancing profile water storage; it was possible to collect at least 80-100 mm of runoff.

An earthen dam constructed to harvest runoff water from a 17.3 ha forest watershed during 1984-85 near village Karoran, forming a part of Patiala-ki-Rao watershed, just 10 km North of Chandigarh. The runoff coefficient of the watershed is 0.35. This earthen dam was designed to store 5.66 ha m of runoff with a total height of 11 m. The cost of the dam construction was Rs. 1.50 lakh which provided the facility of limited irrigation to 18 ha of command area. The available water for irrigation was 2.5 ha m. The cost per m^3 of water storage was Rs. 2.70 during 1982. The water available for use on 1st November every year in the reservoir varied from 498.27 ha cm to 98.89 ha cm. The average water availability was 240.8 ha cm. Average runoff producing rainfall was 701.6 mm. Number of irrigations per year ranged from 1 to 4 in the command area (4 ha in 1987 to 38.2 ha in 1990). On an average, two irrigations were applied over an area of 16.2 ha.

Under the operational research project, two dug out tanks of 2000 m^3 capacity and one community tank of 21,000 m^3 capacity were constructed during 1975-1977. Because of the pervious nature of *Kandi* soils, seepage was the main source of water loss from the tanks. As high as 520 litres/m^2/day seepage loss was recorded from a newly excavated tank. This was, however, reduced to 7 litres/m^2/day when the tank bottom was lined with a polythene film. Evaporation through pan evaporimeter during the effective storage period (September to November) averaged 6.1-3.9 mm/day.

A community tank was renovated at village Nainwan under NICRA scheme to increase its capacity to about 4500 m^3. It is now filled with water every year. The water loss due to seepage from tank was reduced with every passing year. The water of the tank was used for limited irrigation to wheat and drinking purpose of animals. The villagers are getting an annual income or Rs. 15,000 to Rs. 20,000 from fish rearing in the tank.

Dugout Pond with Concrete Lining

A dug-out pond (top dimensions: 22.7 x 19.4 m, side slope 1:1) under Farming System – I (bio-diverse) was constructed to harvest approximately 709.5 m^3 runoff. Cost of rain water harvested with concrete lining comes

as Rs. 0.62/litre of water.

A trapezoidal dug-out pond (top dimensions: 10.5, 46.5, 24.5 & 51.0 m, side slope 1:1) under Farming System – II constructed to harvest approximately 1607.3 m^3 runoff. Cost of rain water harvested with polysheet lining (500 µ, UV stabilized) comes as Rs. 0.15/litre water.

4.1.2.1 Makowal type water harvesting structure

Perennial flow or base flow from the drainage line of a Shiwalik watershed was harnessed at Makowal village of Hoshiarpur district of Punjab for the first time during 1986-87 with technical support of AICRPDA/RRS Ballowal Saunkhri and execution by Punjab State Soil Conservation Department to solve the problem of scarcity of water faced by the community. The model (Makowal system) was replicated with the financial support of World Bank under Integrated Watershed Development Project (Hills) during 1991 to 1999 and including one at Regional Research Station, Ballowal Saunkhri.

Table 13: Technical specifications of the Makowal type water harvesting structure at Ballowal

S. No.	Key features	
1	Catchment area	570 ha (180 ha for weir design)
2	Design discharge	25 cumecs
3	Pipe diameter	15 cm
4	Length of pipe line	4896 m
5	No. of outlets	67
6	Command area	90 ha (Ballowal, Takarla and Mansewal)
7	Families involved	183
8	Additional pipe laid	22.5 cm diameter

Filter pipes were put to collect water in wells. A barrier wall was made across the choe bed and then water was taken to siltation tank and then to pipeline for irrigation. The study of average monthly discharge from Makkowal type water harvesting system revealed that the discharge is maximum during the month of August and minimum during the month of June.

Water is non-saline, neutral in pH and fit for irrigation. Water table is deep during the month of May and rises during the monsoon months and least depth during the month of September.

The impact assessment of a community based Makowal type structure (MTS) water harvesting system in the Shivalik foothills of northern India showed farming community satisfaction with availability & charges of water and performance of the MTS. After introduction of MTS, farmers started to grow paddy in *kharif* and vegetables and fodder in *Rabi* season besides adopting poplar and dek based agroforestry. The increase in cropped area due to MTS was to the tune of 46.1% in *kharif* and 36.3% in *rabi* (Table 14).

Table 14: Shift in area under different crops and their productivity before and after the introduction of MTS across the crop seasons

Season/crops	Area (ha)			Grain or seed yield (t/ha)		
	Before MTS	After MTS	Change (%)	Before MTS	After MTS	% increase over before MTS
Kharif						
- Fallow	19.13 (33.9)	1.90 (3.4)	-90.1	-	-	-
- Maize	22.17 (39.2)	25.48 (45.1)	14.9	1.50	3.17	111.3
- Pearl millet (f)*	15.20 (26.9)	22.32 (39.5)	46.8	26.31*	40.81*	55.1
- Paddy	-	6.80 (12.0)	-	-	5.14	-
- Total	56.50	56.50	-	-	-	-
Rabi						
- Fallow	20.22 (35.8)	7.05 (12.5)	-65.1	-	-	-
- Wheat	22.90 (40.5)	41.20 (72.9)	79.9	1.53	3.55	132.0
	6.20 (11.0)	2.68 (4.7)	-56.8	0.63	0.82	30.2
- Raya	4.88 (8.6)	2.32 (4.1)	-52.5	0.70	0.76	8.6
- Pulses	2.30 (4.1)	0.75 (1.3)	-67.4	0.75	0.85	13.3
- Vegetables	-	0.90 (1.6)	-	-	17.92†	-
- Fodder	-	1.60 (2.8)	-	-	34.72*	-
- Total	56.50	56.50	-	-	-	-

MTS=Makowal type structure

Values in parenthesis are percentage

*Green fodder yield † Green vegetable yield

Column sums may not add up to 100% due to rounding

Table 15: Input use pattern in maize and wheat before and after the introduction of MTS

Inputs	Maize		Wheat	
	Before MTS (n=53)	After MTS (n=63)	Before MTS (n=56)	After MTS (n=70)
Use of seed rate (% reporting)				
- Recommended‡	49.1	74.6	75.0	98.6
- Higher than recommended	50.9	25.4	25.0	1.4
Seed rate (kg/ha)	22.5	21.3	104.7	100.2
Nitrogen (kg/ha)	57.6	68.9	57.5	75.4
Phosphorus (kg/ha)	25.1	44.7	20.5	47.9
Use of pesticides (% reporting)				
- Yes	5.7	33.3	7.1	32.9
- No	94.3	66.7	92.9	67.1

MTS=Makowal type structure

‡ *Recommended seed rate for maize and wheat is 20 and 100 kg/ha, respectively*

Table 16: Relative contribution of different sources to the overall income (% share) before and after the introduction of MTS.

Source of income	Before MTS	After MTS	Change (%) over before MTS
On-farm			
- Crops	21.6 (±14.3)	36.0 (±15.5)	66.7
- Dairy farming	7.2 (±5.1)	13.1 (±7.4)	101.4
- Agro-forestry	-	3.8 (±5.7)	-
- A. Sub-total (On-farm)	*28.8*	*52.8*	*83.3*
Off-farm			
- Labour	49.3 (±29.8)	36.3 (±24.7)	-26.4
- Community forest area	7.0 (±8.7)	2.4 (±4.3)	-65.7
- Other sources	15.0 (±27.7)	8.4 (±18.1)	-44.0
- B. Sub-total (Off-farm)	*71.3*	*47.2*	*-33.8*
Total (A+B)	100.0	100.0	-

MTS=Makowal type structure

†*Value in parentheses: ± s.d.*

Column sums may not add up to 100% due to rounding

Among crops, maximum increase in area was observed in pearl millet (f) (46.8%) during *kharif* and 79.9% wheat during *rabi* season. The increase in the productivity of *kharif* crops

ranged from 55.1 to 111.3% while in *rabi* crops it ranged from 8.6 to 132.0% depending on the crop type. With the availability of life saving irrigation, the varietal spectrum changed in favour of hybrids, composites and high yielding varieties. The farmers started using improved inputs and recommended agronomic practices such as seed rate, fertilizers and pesticides (Table 15 & 16). Introduction of MTS has positive impact on the on-farm (crops, dairy and agro-forestry).

4.1.2.2 Storage and lining requirements and materials

About 55-90% loss of stored water was due to seepage from the water harvesting structures and the remaining loss was due to evaporation. Seepage losses accounted for 61.6% of total water losses on average monthly basis. They were maximum in December (84.4%) and minimum during May (10.9 %). However, the total losses were maximum in September (1.68 cm/day) and minimum in March (0.72 cm/day). It may be difficult to reduce evaporation from tanks except through reducing surface area of water. This indicates that reducing seepage losses would be highly rewarding. Efforts have been made to check seepage by the use of polyethylene sheets, bricks or plasters of various kinds. Sealing of tanks is thus considered vital to store more water in the tanks in the region. The availability, effectiveness, cost and maintenance of different sealing materials was studied. It was found that 800 gauge (200 micron) polythene sheet covered under 20 cm layer of soil was quite effective for lining tank bottoms, whereas brick and cement lining (7.5 cm thick) was found effective for lining the sides of the tank. The seepage losses through the brick lining were still above the tolerable limits. There was a gradual reduction in seepage losses over the years. Due to pervious nature of *kandi* soils seepage is the main source of water loss from earthen tanks.

4.1.2.3 Recycling of harvested water

Field investigations indicate that areas which do not receive rain during early irrigation give a highly favourable response, particularly on light-textured soils. The entire available water may be applied to enhance seeding time storage in the root zone. The detailed studies indicate that 5-6 cm water applied pre-sowing or post-sowing as supplemental irrigation increased the yields of wheat significantly (Table 17). The effect was more pronounced in years of low rainfall during *Rabi* or when moisture storage at sowing was inadequate. During years of well

distributed rainfall and adequate moisture storage at sowing, the crop was not benefited by supplemental irrigation. The response to one irrigation over no irrigation as control (unirrigated) in terms of yield increased initially and after a threshold of rainfall, it decreased with increasing yield of unirrigated plots.

Table 17: Effect of one supplemental irrigation (5 cm water) at initial moisture stress on wheat yield

Year	Rainfall (mm)	Wheat yield (q/ha)		Increase in yield over control (%)
		Control	Irrigated	
1973-74	141	34.4	38.8	12.8
1974-75	153	26.5	37.5	41.5
1975-76	227	33.0	36.8	11.5
1976-77	48	3.8	9.9	160.5
1977-78	192	39.2	41.0	4.5
1978-79	323	32.7	42.3	29.4
1979-80	101	12.6	25.7	104.0
1980-81	340	29.5	35.3	19.7
1981-82	346	28.3	44.9	58.7
1982-83	409	19.3	27.3	41.5
1983-84	149	26.4	28.4	7.6
Mean	**221**	**26.0**	**33.4**	**44.7**

The following conclusions were drawn from the experiments conducted on efficient use of harvested rain water:

- Under the situation of deficit seed zone moisture, pre-sowing irrigation to wheat proved beneficial and increased seed yield.
- Under the situation where seed zone moisture was enough, the irrigation at crown root initiation to wheat proved better than at other stages.
- One irrigation to wheat to large areas was found beneficial over two irrigations to smaller area.
- One irrigation to maize at the stage of tasseling and pollination saved the crop from drought stress and resulted into higher maize yield. It left more residual profile moisture at sowing time of following *Rabi* crop.

- Since stored water is hardly available upto the month of January in most reservoirs, it is, therefore, important to use it before that time. A crop of toria or short duration vegetable can be taken during September to January with this limited quantity of stored water.
- Use of limited available water as pre-sowing irrigation to Raya proved remunerative.

4.2 Cropping systems

Identification/evaluation of crops and development of crop production technologies better suited to dryland conditions is an integral part of this research project. Performance of crops and cropping sequences is related to moisture storage capacity of the soil profile, period of the crop and rainfall characteristics. Prominent rainfed cropping systems practiced in this area are: Maize/Mash – Wheat/ Wheat + Raya , Maize – Wheat/Gram/Lentil + Raya, Bajra/Guara – Raya/Taramira, Sorghum (Fodder) – Taramira and Sesamum – Taramira

Field experiments were conducted to identify the most suitable crops and cropping sequences under varying conditions of soil and moisture availability. The crops grown during *kharif* included maize, mash, moong, sesamum, groundnut, soybean, arhar, fodder crops of bajra, sorghum, cowpea, guara, green manure crops of sunhemp and dhaincha; and wheat, barley, oats, gram, lentil, rapeseed and mustard during *rabi*. Experiments on castor, sunflower and safflower were also conducted. The results indicated that cultivation of Sunflower and Safflower can be done successfully under rainfed situation.

Maize has been confirmed to be the most suitable and assured crop during *kharif* season. However, its performance in soils of low moisture storage capacity was poor. Pearl millet (fodder) performed better than maize in sandy soils and the yield of the following *rabi* crops viz. wheat, gram, barley and raya was better than when they followed maize. The yield of *rabi* crops was poor in sandy soil due to inadequate moisture at sowing but was stable when the crops were grown in plots kept fallow during the preceding *kharif* season. Sowing of 2-4 rows of pearlmillet around maize field saved maize crop from animal and human damage, worked as wind break and provided fodder for livestock.

Growing of green manure sunhemp crop on sandy soils compared to fallow during *Kharif* seems to be better in several ways. Green manure crop reduces the shearing capacity of rain drops, checks the flow of runoff water, increases infiltration, controls soil erosion, lowers

soil temperature, checks evaporation land supplements nutrients and organic matter after being incorporated in the soil.

Wheat crop after green manuring in *kharif* gave almost the same yield as obtained from two crops of maize and wheat in a sequence on loamy sand soil. Yield of wheat after fallow were also stable but fluctuated widely from year to year in sequence with maize. Growing of a short duration legume crop of moong gave an additional yield of 3 to 4 q/ha and it appears to be a better choice as compared to keeping light textured soils fallow and growing a green manure crop. While comparing age of green manure sunhemp crop, wheat yield was considerably higher after green manuring of 40 day old sunhemp than that of 30, 50 and 60 days old crop.

On sandy loam soils, having medium to high moisture retentive capacity, the combined yield of the two crops per year was always considerably higher than that of a single *rabi* crop, irrespective of the crops grown. The yield of maize was quite stable on this soil. Consequently maize-wheat or wheat + gram was the best sequence for sandy loam soil. The farmers continue to grow wheat + gram mixture in soils of moderate water storage capacity due to its comparatively low nutrient requirement as compared to pure wheat. Pure wheat fares better in years of favourable rainfall whereas in low rainfall years, wheat + gram mixture fares better. Similarly, wheat + raya in rows (one row of raya after 12 rows of wheat) proved more remunerative compared to wheat alone.

Table 18: Performance of wheat crop after fallow or green manure with sunhemp during *kharif*

Year	Wheat yield (q/ha)	
	Fallow	**Green manure**
1981-82	33.0	39.7
1985-86	18.9	18.8
1986-87	26.9	36.4
1991-92	20.4	29.1
1994-95	16.5	22.4
Mean	**23.1**	**29.3**

Therefore, growing two crops a year proved more profitable than a single crop on medium and high moisture storage soils. However, on soils of low moisture storage (sandy to loamy sand), single crop of wheat after growing a green manure crop during monsoon was more profitable (Table 18). A good crop of mustard (raya) can be grown after maize in adequate moisture storage soils, provided suitable plant protection measures are taken.

i) Intercropping systems

Unlike irrigated conditions, the performance of the crops under rainfed conditions depends entirely on rainfall. Cultivation of sole crop under such conditions is not profitable especially under severe drought conditions. Therefore, intercropping of different crops in the main crop is the only alternative to compensate the total loss due to crop failure under mid and late season's drought and also to get an additional yield benefit in case of normal crop season. Keeping this in view experiments were conducted to identify suitable crop geometry and row ratio for intercropping of green gram and black gram, sesamum with maize and chickpea and raya in wheat.

Table 19: Effect of intercropping of greengram with maize on maize equivalent yield under rainfed conditions (2003, 2004 & 2005)

Treatments	Yield (q/ha)		
	Pooled mean		
	Maize	Green gram	MEY
Sole maize (60 cm X 22.5 cm)	20.1	-	20.1
Sole green gram (30cm X 10 cm)	-	7.16	21.7
Maize (50 cm X 22.5 cm) + one row of green gram	14.7	4.73	29.0
Maize(60 cm X 22.5 cm)+ one row of green gram	13.5	4.09	26.6
Maize (75 cm X 22.5 cm) + two rows of green gram	10.9	4.95	26.0
Maize (90 cm X 22.5 cm) + two rows of green gram	9.34	4.56	23.3
Maize (paired rows at 45-60 cm X 22.5 cm) + one row of green gram	16.5	2.42	23.7
LSD (P= 0.0 5)	3.60	1.30	4.40

Intercropping of greengram/blackgram with maize (1:1) at 50 cm row spacing resulted in maximum maize equivalent yield in the earlier experiments but in the later on intercrooping of greengram with maize in *kharif* season revealed that intercropping of one row of green gram in between two rows of maize spaced at 50 cm gave higher mean maize equivalent yield (Table 19) and the mean percent increase in yield was 44.4% over sole cropping of maize, while in

another study intercropping of one row of black gram in between two rows of maize spaced at 50 cm gave highest maize equivalent yield (Table 20) and the mean percent increase in yield was 18% over sole cropping of maize.

Table 20: Effect of intercropping of black gram with maize on the productivity of maize and black gram and maize equivalent yield under rainfed conditions (2003, 2004 & 2005)

Treatments	Yield (q/ha)		
	Pooled mean		
	Maize	Black gram	MEY
Sole maize (50 cm X 22.5 cm)	23.7	-	23.7
Sole maize (60 cm X 22.5 cm)	22.7	-	22.7
Sole black gram (30cm X 10 cm)	-	8.35	28.9
Maize (50 cm X 22.5 cm) + one row of black gram	18.1	4.64	34.3
Maize(60 cm X 22.5 cm)+ one row of black gram	16.9	4.17	30.6
Maize (75 cm X 22.5 cm) + two rows of black gram	13.5	5.50	32.7
Maize (90 cm X 22.5 cm) + two rows of black gram	12.5	5.08	30.2
Maize (paired rows at 45-60 cm X 22.5 cm) + one row of black gram	16.4	2.59	25.4
Maize (paired rows at 60-45 cm X 22.5 cm) + one row of black gram	16.3	2.55	26.1
LSD (P= 0.0 5)	3.30	1.20	4.50

Intercropping of blackgram, greengram and sesamum in maize

In a recent experiment conducted with the aim of increasing the cropping intensity on intercropping of balckgram, greengram and sesame with paired row of maize revealed that among intercropping of blackgram, greengram & sesamum with paired rows (30/60cm) of maize, highest MEY (Table 22) was recorded when greengram (one rows) was intercropped

with paired rows (30/60cm) of maize, followed by intercropping of blackgram (two rows) between paired rows of maize. The highest B:C ratio was obtained with intercropping of greengram between paired rows (30/60cm) of maize .

Sowing of 2-4 rows of pearlmillet/sorghum as guard crop around maize field resulted in minimum damage to maize crop from stray cattle and also provided fodder for livestock.

Raya intercropping in wheat and gram at 3.0 m apart with North-South direction and in lentil at 2.0 m apart provided additional income and also covered the risk of crop failure under rainfed conditions. Raya intercropping in wheat gave 5.2 q/ha (8.4 % percent) higher wheat equivalent yield over sole wheat.

Wheat + Raya

Chickpea + Raya

Table 21: Performance of wheat & raya as sole and intercrop (grain yield, q/ha)

Year	Wheat	Raya	Wheat + Raya
1990-91	30.1	9.9	26.8 + 1.4
1991-92	42.3	9.8	38.1 + 3.5
1993-94	39.4	9.9	33.4 + 2.6
1994-95	25.0	10.1	21.6 + 2.8
Mean	**34.2**	**9.9**	**30.3 + 2.6**

Table 22: Maize equivalent grain yield, economics and water use efficiency for different intercrops and different row ratios

Treatments	Maize equivalent grain yield (kg/ha)					B:C ratio	Water use efficiency (kg/ha/mm)				
	09-10	10-11	11-12	12-13	Mean		09-10	10-11	11-12	12-13	Mean
T_1 : Sole maize (45.0 cm × 22.5 cm)	1872	3273	2583	3178	2877	2.68	4.48	5.67	3.36	7.3	5.20
T_2 : Sole blackgram (30.0 cm × 10.0 cm)	2208	2651	1629	1827	1995	2.26	5.29	4.52	2.12	4.19	4.03
T_3 : Sole greengram (30 cm × 10.0 cm)	2292	1775	1761	1908	1926	2.07	5.49	3.43	2.29	4.83	4.01
T_4 : Sole sesame (30 cm × 10.0 cm)	1417	2147	1633	2700	2216	2.37	3.39	3.66	2.12	6.2	3.84
T_5 : Maize (paired row 30/60 cm) + blackgram (one row)	2269	3500	2740	3328	3082	2.68	5.43	5.97	3.56	7.64	5.65
T_6 : Maize (paired row 30/60 cm) + greengram (one row)	2926	3433	2855	3397	3234	2.77	7.01	5.94	3.71	7.8	6.12
T_7 : Maize (paired row 30/60 cm) + sesame (one row)	1792	2907	2549	3301	2859	2.36	4.29	4.96	3.31	7.58	5.04
T_8 : Maize (paired row 30/60 cm) + blackgram (two rows)	2418	3646	2668	3499	3205	2.63	5.79	6.22	3.47	8.03	5.89
T_9 : Maize (paired row 30/60 cm) + greengram (two rows)	2987	3455	2660	3299	3167	2.60	7.15	5.98	3.46	7.57	6.04
T_{10} :Maize (paired row 30/60 cm) + sesame (two rows)	1588	2763	2165	2973	2573	2.07	3.8	4.71	2.81	6.83	4.54
CD (0.05)	275	346		547							
Rainfall (mm)	417.6	577.7	769.7	435.6	512.0						

ii) Double cropping

Research trials had shown that soils of high and medium water holding capacity were suitable for double cropping such as maize-wheat system. In case of residual soil moisture after *kharif* crop, raya in *rabi* was found most profitable. On light soils with low water holding capacity (loamy sand and sandy soils), single *rabi* crop of wheat, gram or wheat + gram mixture after keeping fallow during monsoon was found to be more profitable than double cropping.

In dryland agriculture soil moisture play important role in crop establishment. Keeping this in view, experiment was planned to study the effect of different *kharif* season crops on succeeding *rabi* crops productivity of the cropping system.

Among the *kharif* crops, the highest maize equivalent yield (MEY) was recorded in maize crop which was higher than blackgram, sesamum and pearlmillet (f) (Table 23).

Table 23: Effect of different rainy season crops on the productivity, profitability and sustainability of rainfed *rabi* crops

	Treatment	**Grain yield (kg/ha)***							
		2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**Mean**	**Mean BC ratio of all products**	**RWUE (%)**
***Kharif* crops**	Maize	2870	3407	3921	2801	-	3250	-	7.03
	Blackgram	691	985	827	956	-	865	-	1.82
	Sesame	345	581	457	290	-	418	-	0.91
	Pearl millet (fodder)	36670	39704	57516*	45333	-	44806	-	109.77
	Sunhemp	20800*	13122*	51800*	28333*	-	28514	-	84.56
Wheat	Maize	548	1074	1518	2326	-	1367	3.06	7.05
	Blackgram	908	2426	1656	2487	-	1869	3.82	7.73
	Sesame	-	870	1463	2140	-	1491	2.39	5.54
	Pearl millet (fodder)	863	3556	1148	2250	-	1954	3.52	6.59
	Sunhemp	694	3970	1759	2886	-	2327	2.88	8.91
	Mean	753	2379	1509	2418	-	1802	3.13	7.17
	S.Em	73.8	573.7	95.0	119.0	-	-	-	-
	CD (0.05)	191	507	371	393	-	-	-	-
	CV (%)	12.7	59.1	15.4	8.5	-	-	-	-
Barley	Maize	333	1611	1956	2566	-	1617	3.11	8.72
	Blackgram	523	2611	1985	2824	-	1986	3.85	9.25
	Sesame	-	1500	2133	2340	-	1991	2.49	9.60
	Pearl millet (fodder)	488	2889	1926	2261	-	1891	3.11	8.95
	Sunhemp	453	3000	2222	3071	-	2187	2.36	9.15
	Mean	449	2322	2044	2612	-	1934	2.98	9.13
	S.Em	36.9	292.0	51.9	181.0	-	-	-	-
	CD (0.05)	115	856	NS	NS	-	-	-	-
	CV (%)	12.8	30.8	6.2	12.0	-	-	-	-

Raya	Maize	581	796	1371	1363	-	1028	3.87	6.48
	Blackgram	847	1815	1502	1500	-	1416	5.11	6.16
	Sesame	347	1037	1422	1215	-	1005	3.41	11.77
	Pearl millet (fodder)	767	1981	1151	952	-	1213	3.97	5.23
	Sunhemp	862	2074	1558	1563	-	1514	3.78	7.87
	Mean	681	1541	1401	1319	-	1235	4.03	7.50
	S.Em	97.3	238.2	64.1	92.0	-	-	-	-
	CD (0.05)	174	542	NS	303	-	-	-	-
	CV (%)	13.5	37.9	11.2	12.0	-	-	-	-
Chickpea	Maize	-	1018	518	1307	-	948	3.44	4.22
	Blackgram	-	1667	578	1251	-	1165	4.12	3.83
	Sesame	-	926	478	1189	-	864	2.78	3.61
	Pearl millet (fodder)	-	1826	333	1400	-	1186	3.82	4.37
	Sunhemp	-	1852	583	1289	-	1241	2.52	4.14
	Mean	-	1458	498	1287	-	1081	3.33	4.04
	S.Em	-	183.8	41.7	94.0	-	-	-	-
	CD (0.05)	-	361	164	NS	-	-	-	-
	CV (%)	-	30.9	20.5	12.6	-	-	-	-

*Yield of green biomass at 40 DAS

During *rabi* season, grain yield of all crops was higher when grown after sunhemp as compared to when grown after blackgram, pearlmillet (f) sesamum and maize (Table 23). The wheat equivalent yield (WEY) of raya was maximum followed by chickpea, wheat and barley. The WEY of blackgram-raya was highest followed by pearlmillet-raya and blackgram-chickpea sequence. Total productivity of cropping sequence was also recorded higher in blackgram-raya, maize-raya and maize-chickpea sequence, which were considerably higher as compared to traditional cropping sequence i.e. maize-wheat. Thus cultivation of raya and chickpea was found to be more profitable when grown after blackgram and maize crops.

Blackgram-raya and blackgram-chickpea cropping systems gave maximum net returns followed by pearl millet- raya/wheat cropping system. Wheat Equivalent Yield of raya was significantly higher when sown after blackgram, sunhemp and pearlmillet (fodder) than after maize and sesame. Thus, blackgram-raya and black gram-chickpea cropping sequences are more profitable than the traditional Maize-Wheat sequence giving additional income of Rs. 16000/- and Rs. 9000/-, respectively.

Rabi crops after black gram Rabi Crops after sesamum Rabi Crops after maize

a) Effect of seed rate, spacing and sowing time on crop yield

Sowing time of the crop, seed rate and plant/row spacing play important role in the final crop stand and ultimately crop yield. Since inception of the centre, number of experiments has been conducted during both season to find out the optimum sowing time, seed rate and spacing for higher yield.

Sowing of castor at 75 cm row spacing gave significantly higher seed yield (Table 25) as compared to other row spacings. However, increase in plant spacing from 45 cm to 60 cm has no significant effect on seed yield.

Table 25: Effect of varying row and plant spacings on the yield of castor (GCH 4) under rainfed conditions.

Treatments	Seed yield (q/ha)
Row spacing (cm)	
75	20.3
100	16.7
125	16.5
150	16.3
175	16.2

L.S.D. (P=0.05)	2.25
Plant spacing (m)	
45	16.7
60	17.6
L.S.D. (P=0.05)	NS

Sowing of maize hybrids at spacing of 45 x 22.5 cm gave higher yield, B:C ratio and rain wtare use efficiency (Table 24) compared to 60 x 22.5 cm. Maize hybrids Parkash and JH 3459 at spacing of 45 x 22.5 cm performed better under rainfed conditions than other treatments.

Table 24: Effect of varying spacing on the productivity of maize hybrids under rainfed conditions

S.No.	Treatment	Grain (kg/ha)*					
		2005-06	2006-07	2007-08	Mean	Mean B: C ratio of all products	RWUE (%)
Hybrid							
JH 3851		3985	-	-	3985	-	-
JH 3459		4166	3520	2289	3325	2.16	5.99
Parkash		4340	3900	2387	3542	2.31	6.48
Megha		-	3280	2113	2697	2.19	5.56
PMH-2		-	3830	-	3830	2.50	7.71
Mean		4164	3633	2263	3476	2.29	6.43
CD (0.05)		NS	NS	191	-	-	-
Spacing							
45 x 22.5 cm		4372	3980	2395	3582	2.15	6.57
50 cm		4210	-	-	4210	-	-
60 x 15 cm		-	-	2287	2287	2.00	4.89
60 x 20 cm		-	3610	2365	2988	2.23	6.16
60 x 22.5 cm		3910	3300	2005	3072	2.26	5.46
Mean		4164	3630	2263	3228	2.16	5.77
CD (0.05)		366	470	220	-	-	-

Two different experiments to find out the optimum sowing window were conducted and it was concluded that chickpea sowing on 20th October has a significant edge over 5th and 20th November sowing dates and yield decreased with delay in sowing (Table 26). In other experiment 8th Nov. gave higher yield than other sowing dates in November and yield decreased significantly with further delay in sowing (Table 27). Thus the optimum sowing

window for chickpea under rainfed conditions is 20th October to first week of November. Increase in the seed rate from 40 to 60 kg/ha have no effect on seed yield.

Table 26: Effect of different dates of sowing and seed rates on the seed yield of chickpea cultivars under rainfed conditions.

Treatments	Seed yield (q/ha)		
	2003-04	2004-05	Mean
Sowing dates			
20th October	7.25	16.8	12.0
5th November	6.32	14.0	10.2
20th November	3.00	8.45	5.7
L.S.D. (P=0.05)	0.50	2.47	
Genotypes			
PBG 1	5.90	13.2	9.6
PBG 5	5.12	12.9	9.0
L.S.D. (P=0.05)	0.70	NS	
Seed rate (kg/ha)			
40	5.48	12.8	9.2
60	5.54	13.3	9.4
L.S. D. (P=0.05)	NS	NS	

Table 27: Effect of seed rates on the productivity of chickpea cultivars sown on different dates

Treatment	Grain (kg/ha)*		
	2006-07	BC ratio	RWUE (%)
Date of sowing			
1st DoS (8th Nov.)	1760	3.43	6.60
2nd DoS (22nd Nov.)	1440	2.81	6.60
CD (0.05)	172	-	-
Varieties			
PBG 1	1620	3.16	6.60
PBG 5	1580	2.8	6.60
CD (0.05)	NS	-	-
Seed Rate			
40 Kg/ha	1600	3.12	6.60
60 Kg/ha	1600	2.83	6.60
CD (0.05)	NS	-	-

Lentil sowing with 30 kg seed/ha resulted in 15.4 and 21.7% higher mean seed yield as compared to its sowing with higher seed rats of 37.5 and 45 kg/ha, respectively (Table 28). Lentil sowing at 25 cm row spacing gave higher yield but it was statistically at par with 22.5 cm row spacing during both the years. Thus the crop should be sown with 30 kg seed/ha at a row spacing of 25 cm under rainfed conditions.

Table 28: Effect of varying seed rate and row spacing on the productivity of lentil.

Treatments	**Seed yield (q/ha)**		
	2002-03	**2003-04**	**Mean**
Seed rate (kg/ha)			
30	6.49	5.29	5.89
37.5	5.61	4.59	5.10
45	5.23	4.44	4.84
L.S.D. (P=0.05)	0.83	NS	
Row spacing (cm)			
22.5	5.77	4.74	5.26
25.0	6.50	5.19	5.85
30.0	5.07	4.39	4.73
L.S.D. (P=0.05)	0.91	0.50	

iii) Integrated weed management

Numerous plant species are considered weeds in agronomic cropping systems. Weeds have many attributes undesirable to crop producers, not the least being the ability to reduce crop yields through competition for resources such as sunlight, water, nutrients, and space.

Weeds also may harbor insects and provide a host for certain plant pathogens. Some weed species, such as wild garlic and eastern black nightshade, can reduce the quality of the harvested crop. Eliminating or reducing the deleterious effects of weeds on agronomic crops is the ultimate goal of weed management. Integrated weed management includes all practices that enhance a crop's competitive ability and decrease weeds' ability to reduce yield. Successful weed management requires identifying relevant species and understanding their biological characteristics so that management can be tailored to the weeds present in individual fields. Accurate identification is critical: identification of seedling weeds is necessary for selecting an appropriate postemergence herbicide, while identifying mature weeds often

indicates which species will populate a particular field the following season. Most weed species in Illinois agronomic cropping systems are either broadleaves or grasses. Broadleaf species are generally easier to differentiate than grasses, especially at early growth stages. M

In experiment conducted on chemical weed control in blackgram, all the weed control treatments significantly increased the seed yield of black gram as compared to control. The combined application of trifluralin (0.50 kg/ha) as pre-emergence and one hand weeding (HW) at 30 DAS resulted in highest mean seed yield (Table 29) of black gram and was statistically at par with its application at PPI at same dose + one hand weeding at 30 DAS and two hand weeding at 25 and 40 DAS.

Table 29: Effect of weed control treatments on the seed yield of blackgram under rainfed conditions

Treatments	Seed yield (kg/ha)		
	2003	2004	Mean
Pendimethalin PE* @ 0.56 kg/ha	747	729	738
Pendimethalin PE @ 0.75 kg/ha	589	745	667
Pendimethalin PE @ 0.56 kg/ha + one hand weeding at 30 DAS	1023	962	993
Trifluralin PPI** @ 0.50 kg/ha	770	768	769
Trifluralin PPI @ 0.75 kg/ha	813	828	821
Trifluralin PPI @ 0.50 kg/ha + one hand weeding at 30 DAS	1103	1108	1106
Trifluralin PE @ 0.50 kg/ha	844	748	796
Trifluralin PE @ 0.75 kg/ha	779	790	785
Trifluralin PE @ 0.50 kg/ha + one hand weeding at 30 DAS	1173	1085	1129
One hand weeding at 30 DAS	960	735	848
Two hand weeding at 25 & 40 DAS	1122	1044	1083
Weedy check	517	463	490
L.S.D. (P=0.05)	297	191	-

In another experiment conducted on chemical weed control in greengram, application of pendimethalin and trifluralin significantly increased the seed yield of green gram over control. Pre-plant incorporation of trifluralin (050 kg/ha) + one hand weeding (HW) at 30 DAS resulted in higher mean yield (Table 30) of green gram with a mean per cent increase of 7.9, 8.6, 11.3, 43.2 and 146.8 per cent over pendimethalin PE @ 0.56 kg/ha + one hand weeding at 30 DAS, trifluralin PE @ 0.50 kg/ha + one hand weeding at 30 DAS, two hand weeding at 25 & 40 DAS and weedy check, respectively.

Table 30: Effect of weed control treatments on the seed yield of green gram under rainfed conditions

Treatments	Seed yield (kg/ha)		
	2003	2004	Mean
Pendimethalin PE* @ 0.56 kg/ha	856	718	787
Pendimethalin PE @ 0.75 kg/ha	717	710	714
Pendimethalin PE @ 0.56 kg/ha + one hand weeding at 30 DAS	972	893	933
Trifluralin PPI** @ 0.50 kg/ha	818	693	756
Trifluralin PPI @ 0.75 kg/ha	76	764	764
Trifluralin PPI @ 0.50 kg/ha + one hand weeding at 30 DAS	1054	959	1007
Trifluralin PE @ 0.50 kg/ha	728	673	701
Trifluralin PE @ 0.75 kg/ha	656	689	673
Trifluralin PE @ 0.50 kg/ha + one hand weeding at 30 DAS	934	919	927
One hand weeding at 30 DAS	656	750	703
Two hand weeding at 25 & 40 DAS	903	907	905
Weedy check	463	353	408
L.S.D. (P=0.05)	203	137	-

4.2.1 Contingency crop planning

Maize is the predominant crop which is cultivated during *kharif* season in the *Kandi* region of Punjab. It is normally sown with the receipt of pre-monsoon showers or with the onset of monsoon from the last week June upto 10th July. But, the monsoon behavior is very erratic, sometimes its onset is earlier and sometimes it is delayed by weeks or even month. Under such conditions maize crop does not perform well and gives very poor yields. In view of these above situations, experiment was planned to find out suitable seasonal crop/crops which can tolerate early or late season drought and improve the economic conditions of farmers.

Result reveal that under rainfed conditions maize can be sown up to 15th July without any adverse affect on yield. Under delayed onset of monsoon up to 30th July blackgram, greengram and sesamum are better choices than maize crop. If monsoon onset is further delayed then blackgram, pearlmillet fodder and grain crop perform better than maize.

The study was further conducted on different soil types to find out the suitable crop for continegency crop planning in caase of normal and delayed onset of monsoon, during *khairf* season, highest maize equivalent yield (MEY) was observed in pearlmillet (G) followed by blackgram under normal as well as delayed sown conditions in light textured soils. During *rabi*

season taramira proved best in terms of wheat equivalent yield (WEY) and B:C ratio under normal as well as delayed sown conditions (Table 31). Thus, pealmillet (G) during *kharif* and taramira during *rabi* performed best under delayed sown conditions in light textured soils.

Table 31: Contingency crop planning for seasonal drought under late sown conditions in light textured soils

S.No.	Treatment	Grain (kg/ha)*							
		2005-06	2006-07	2007-08	2008-09	2009-10	Mean	Mean BC ratio of all products	RWUE (%)
***Kharif* (Maize equivalent yield)**									
1st DoS	Maize	-	1157	1332	2057	-	1515	1.10	2.73
	Pearl millet (G)	-	2056	2230	1204	-	1830	2.17	4.10
	Pearl millet (F)	-	1466	1469	1583	-	1506	1.77	76.41
	Blackgram	-	1624	1278	2160	-	1687	1.38	1.82
	Greengram	-	958	792	389	-	713	0.67	0.67
	Sesame	-	-	764	1094	-	929	0.90	1.05
	Mean	-	1452	1311	1414	-	1363	1.33	14.46
	S.Em	-	173.9	219.1	151	-	-	-	-
	CD (0.05)	-	-	-	475	-	-	-	-
	CV (%)	-	29.3	40.9	18.5	-	-	-	-
2nd DoS	Maize	-	393	2690	1956	-	1680	1.28	3.37
	Pearl millet (G)	-	1924	2818	1650	-	2131	2.38	5.66
	Pearl millet (F)	-	1172	1655	1615	-	1481	1.72	74.10
	Blackgram	-	1118	2029	2537	-	1895	1.49	2.30
	Greengram	-	217	1651	199	-	689	0.39	0.42
	Sesame	-	-	668	1565	-	1117	1.07	1.62
	Mean	-	965	1919	1587	-	1499	1.39	14.58
	S.Em	-	279.3	322.6	155	-	-	-	-
	CD (0.05)	-	-	-	487	-	-	-	-
	CV (%)	-	70.9	41.2	16.9	-	-	-	-
3rd DoS	Maize	-	-	2304	226	-	1265	1.10	3.54
	Pearl millet (G)	-	-	2862	972	-	1917	1.84	5.27
	Pearl millet (F)	-	-	1709	720	-	1215	1.35	78.59
	Blackgram	-	-	1785	1311	-	1548	1.16	2.08
	Greengram	-	-	1424	599	-	1012	0.93	1.36
	Sesame	-	-	934	632	-	783	0.84	0.92
	Mean	-	-	1836	743	-	1290	1.20	15.30
	S.Em	-	-	275.3	82	-	-	-	-
	CD (0.05)	-	-	-	257	-	-	-	-
	CV (%)	-	-	36.7	19.0	-	-	-	-
***Rabi* (Wheat equivalent yield)**									
1st DoS	Wheat	933	3230	823	1422	-	1602	1.97	22.92
	Barley	637	2670	799	880	-	1247	1.68	14.83

	Triticale	-	-	715	1164	-	940	1.18	20.96
	Lentil	100	-	299	1861	-	753	1.14	28.22
	Taramira	743	1950	1516	1865	-	1519	2.54	21.01
	Raya	616	1520	856	1752	-	1186	1.90	18.80
	Af. Sarson	-	2100	-	-	-	2100	2.58	1.54
	Mean	606	2294	835	1491	-	1335	1.97	18.32
	S.Em	116.9	251.6	148.1	91	-	-	-	-
	CD (0.05)	-	-	-	287	-	-	-	-
	CV (%)	51.1	29.0	46.9	10.6	-	-	-	-
2nd DoS	Wheat	171	1820	357	1108	-	864	1.20	10.86
	Barley	167	2250	370	710	-	874	1.43	10.05
	Triticale	-	-	336	914	-	625		11.59
	Lentil	-	-	0	1078	-	539	0.58	15.63
	Taramira	233	1110	1061	1707	-	1028	1.91	12.91
	Raya	126	970	394	1646	-	784	1.32	14.76
	Af. Sarson	198	1640	-	-	-	919	2.02	2.84
	Mean	179	1558	420	1194	-	805	1.41	11.23
	S.Em	15.0	198.3	131.1	91	-	-	-	-
	CD (0.05)				288	-	-	-	-
	CV (%)	22.2	33.7	82.6	13.3	-	-	-	-
3rd DoS	Wheat	-	-	-	889	-	889	1.10	15.79
	Barley	-	-	-	682	-	682	1.02	12.11
	Triticale	-	-	-	912	-	912	1.07	16.20
	Lentil	-	-	-	893	-	893	0.97	17.72
	Taramira	-	-	-	1632	-	1632	2.30	28.99
	Raya	-	-	-	1231	-	1231	1.61	24.42
	Mean	-	-	-	1040	-	1040	1.35	19.21
	S.Em	-	-	-	98	-	-	-	-
	CD (0.05)	-	-	-	310	-	-	-	-
	CV (%)	-	-	-	16.4	-	-	-	-

On medium textured soils, when the maize crop is sown with the onset of monsoon rains in *kharif*, best Maize equivalent yield (MEY) was obtained in maize followed by blackgram. Similar results were obtained in delayed sowing i.e 15 days after the onset of monsoon (Table 32). However if the sowing was further delayed by 15 days the MEY of maize decreased by 33 percent and 22 percent as compared to normal and delayed sowing by 15 days and in this situation greengram followed by blackgram performed best.

Among different *rabi* crops, tested for contingency crop planning, best wheat equivalent yield (WEY) was obtained in lentil followed by wheat under 1st (October second fortnight) and 2nd (November first fortnight) sowing. In November second fortnight sowing lentil gave maximum WEY followed by barley. In general November sowing gave higher WEY in all the crops compared to October sowing.

Table 32: Contingency crop planning for seasonal drought under late sown conditions in medium textured soils

S.No.	Treatment	Grain (kg/ha)*					BC
		2009-10	2010-11	2011-12	2012-13	Mean	Mean
***Kharif* (Maize equivalent yield)**							
1st DoS	Maize	2556	3659	3752	2359	3082	1.82
	Greengram	1781	823	1179	1729	1378	1.17
	Blackgram	2404	1234	1599	1695	1733	1.42
	Sesame	*	1779	1445	686	1303	1.09
	Pearlmillet (G)	1395	1425	790	2370	1495	1.81
	Pearlmillet (F)	1313	1581	1694	491	1270	1.44
	Guara			1697	1840	1769	1.68
	Mean	1890	1750	1737	1596	1710	1.46
	CD (0.05)	336	305	232.3	244	-	-
2nd DoS	Maize	1738	2763	1980	3195	2419	1.51
	Greengram	760	815	2379	933	1222	0.99
	Blackgram	1454	1250	2934	3001	2160	1.78
	Sesame	1446	2515	1963	598	1631	1.27
	Pearlmillet (G)	1279	1370	1138	2255	1511	1.86
	Pearlmillet (F)	1012	1644	1843	605	1276	1.42
	Guara*			906*	1486	1486	1.35
	Mean	1281	1726	1878	1725	1672	1.45
	CD (0.05)	195	258	243.7	248	-	-

3rd Sowing	Maize			1334	1929	1632	1.16
	Greengram			2891	2889	2890	2.45
	Blackgram			2075	2361	2218	1.95
	Sesame			1252	488	870	0.91
	Pearlmillet (G)			846	1711	1279	1.42
	Pearlmillet (F)			1620	1070	1345	1.51
	Guara*			453*	1127	1127	1.0
	Mean			1496	1654	1623	1.49
	CD (0.05)			58.7	269	-	-
***Rabi* (Wheat equivalent yield)**							
1st DoS	Wheat	461	2760	2412	2231	1966	1.83
	Barley	517	1577	3215	1532	1710	1.93
	Triticale	556	1771	2598	1615	1635	1.56
	Lentil	1960	3599	1170	1842	2143	1.85
	Raya	941	2307	824	1880	1488	1.54
	Taramira	548	2666	354	1591	1290	1.65
	Af. Sarson	336	2675	477	1781	1317	1.34
	Mean	760	2479	1579	1782	1650	1.67
	CD (0.05)	156	464	302	346	-	-
2nd DoS	Wheat	*	3230	1352	2616	2399	2.07
	Barley	357	3206	2968	2061	2148	2.33
	Triticale	280	3619	2844	2547	2323	1.97
	Lentil	1866	4797	2617	2731	3003	2.49
	Raya	573	5150	1015	1472	2053	2.01
	Taramira	*	4051	700	957	1903	2.25
	Af. Sarson	*	4676	843	1023	2181	2.06
	Mean	769	4104	1763	1915	2287	2.17
	CD (0.05)	220	615	314	659	-	-
3rd DoS	Wheat			608	1992	1300	1.12
	Barley			1443	2115	1779	1.82
	Triticale			871	1797	1334	1.18
	Lentil			904	2743	1821	1.48
	Raya			413	2234	1324	1.31
	Taramira			859	1128	994	1.28
	Af. Sarson			683	1139	911	0.92
	Mean			826	1878	1352	1.30
	CD (0.05)			123	455	-	-

Under Real time contingency crop planning, different intercropping systems were evaluated in farmer's fields. During *kharif* season maximum maize equivalent yield was recorded in maize + blackgram intercropping system and during *rabi* season, chickpea + raya gave highest yield. The improved cropping sequences were also introduced to cope with the rainfall variability. Maize- raya cropping sequence recorded higher wheat equivalent yield, net returns and BC ratio. Summer ploughing, sowing across the slope and earthing up operations gave increased soil moisture and yield compared to farmer's practice. The sowing with seed drill resulted uniform germination, better crop stand and higher yield and net returns in wheat and raya.

Table 33: Contingency crop planning for *kharif* crops under early season drought conditions

Crop	Green gram equivalent yield (q/ha)		Per cent decrease in yield
	20th July	5th August	
Green gram	5.06 (5.06)	1.48 (1.48)	70.8
Blackgram	9.21 (7.89)	4.27 (3.66)	53.6
Sesamum	5.49 (3.66)	-	100.0
Pearlmillet (F)	7.42 (6.68)	3.38 (3.04)	54.5
Clusterbean (F)	-	2.35 (169)	-

***Values in parthensis are green gram equivalent yield*

Blackgram as well as pearlmillet (fodder) performed well and gave respective green gram equivalent yield of 7.89 and 6.68 q/ha as compared to greenram (5.06 q/ha), and sesame (3.66 q/ha) during early season drought. However, sesamum resulted in total crop

failure when sown on 5th August. Poor germination was the main reason cause of overall low crop yields in crops sown on 5th August.

Table 34: Contingency crop planning for *rabi* season crops under early season drought conditions (2003-04)

Crop	Wheat equivalent yield (q/ha)		Per cent decrease in yield
	19th December	9th January	
Wheat	11.3	8.5	24.3
Barley	8.2	5.3	35.0
Lentil	3.4	-	100.0
Taramira	13.7	11.9	24.9
African sarson	22.7	17.1	13.3

African sarson performed well under late sown conditions and resulted in least per cent decrease in wheat equivalent yield. However, lentil crop totally failed under late sown conditions. Thus, under early season drought conditions late sowing of wheat, African sarson and tarmaira can be done.

Table 35: Studies on effect of thiourea application in rainfed wheat

Treatment	Grain (kg/ha)*						
	2009-10	2010-11	2011-12	2012-13	Mean	Mean B:C	Mean RWUE (%)
T_1 : Control	999	2057	2156	2003	1804	1.67	9.98
T_2 : Seed soaking (1000 ppm)	1056	2145	2254	2168	1906	1.75	10.73
T_3 : Seed soaking (1500 ppm)	1046	2128	2235	2128	1884	1.72	10.39
T_4: Spray at max. tillering & booting stage (1000 ppm)	1139	2298	2422	2429	2072	1.82	11.56
T_5: Spray at max. tillering & booting stage (1500 ppm)	1127	2276	2403	2241	2012	1.75	10.82
T_6 : Seed soaking (1000 ppm) + spray at maximum tillering & booting stage (1000 ppm)	1201	2395	2536	2531	2166	1.90	12.47
T_7 : Seed soaking (1500 ppm) + spray at maximum tillering & booting stage (1500 ppm)	1185	2367	2500	2481	2133	1.83	12.24
Mean	1108	2238	2358	2283	1997	1.78	11.17
S.Em	39	72	82	103	-	-	-
CD (0.05)	121	223	252	321	-	-	-
CV (%)	6.1	5.6	6	7.8	-	-	-

The heat stress at the time of grain filling in wheat is becoming a limiting factor for yield and results in shrivelled grains and reduction in yield. So, experiment for mitigation of this terminal heat stress with thiourea was conducted for four consecutive years. Seed soaking + two sprays (one at maximum tillering & second at booting stage) with 1000 ppm thiourea in wheat crop significantly increased yield over control. It also recorded highest B:C ratio and RWUE (Table 35).

4.3 Nutrient Management

In rainfed areas, the soils are not only thirsty but also hungry. It is now well recognized that fertilizer use is a key factor in increasing crop production under both irrigated as well as rainfed conditions. Contrary to the general belief, fertilizer application has been found to be highly effective and remunerative in drylands. However, the response to fertilizer varies with the available water supplies to the crop. There is a need to ratinalise the fertilizer use. When it is broadcasted on the upper soil layers, it does not become available to the emerging seedlings and by the time it becomes available, some damage is already caused to the plant. Therefore, for increasing the fertilizer use efficiency in drylands, it is essential to apply the fertilizer at a proper time and placed at a proper depth in the plough layer.

4.3.1 Nutrient management in *kharif* crops

i) Maize

The farmers mostly grow local varieties of maize, whereas Megha has been recommended for this region. Different varieties respond to varying levels of nitrogen on different soil types. Early experiments (1973-75) were conducted on varying rates of fertilizer application on different soil types. It was revealed that response to N was obtained up to 80 kg N/ha on sandy loam soils having medium moisture storage and up to 40 kg N/ha on loamy sand soil having low moisture storage. Higher rates of N depressed crop yield on both the soils, particularly in years of below normal rainfall. It was also noted that the N fertilized crop utilized more profile water than the unfertilized crop, particularly from lower soil layers during the low rainfall years. In trials conducted during 1991-92, application of 100 kg N/ha showed significant response over 40 and 60 kg N/ha on loamy sand and sandy loam soils respectively.

In trials conducted during 1972-78, the response of maize to P application was not observed in soils which tested medium in available P but the response to applied P was

significant on a soil testing low in available P. In general, the farmers apply a basal dose of FYM which appears to take care of the P requirement of the crop. During the crop growth of maize, under conditions of adequate water availability in the soil and normal soil temperature, the soil P gets mineralized and becomes available to the maize crop.

During monsoon season, sufficient moisture remains available in the soil due to frequent rains but due to erratic rainfall behaviour, frequent droughts are often observed during crop growing season. It is the notion that use of high analysis fertilizers should be avoided under dryland conditions mainly because of uncertainty of continuous availability of moisture. The results of an experiment conducted for four years (1992-95) indicated that all the three sources of N fertilizer i.e. Urea, Calcium ammonium nitrate and ammonium chloride were at par with regard to yield of maize (Table 36). Even at higher levels of N, no significant differences were observed in the effect of these sources.

Table 36: Effect of different sources of N fertilizer on maize yield (q/ha)

Year/source of N fertilizer	Maize yield (q/ha)		
	Urea	**Calcium ammonium nitrate**	**Ammonium chloride**
1992	15.10	15.83	15.40
1993	18.63	19.30	15.50
1994	27.85	28.54	27.19
1995	21.90	19.65	19.07
Mean	**20.90**	**20.80**	**19.30**

The results of fertilizer placement experiments showed that there was no difference amongst methods of N application in maize grown during the rainy season. However, application of N in two splits viz. ½ at sowing and other ½ band placed at knee high stage proved slightly better as compared to whole drilled or broadcasted at sowing. The foliar application of N was not found viable in maize as the same was washed during frequent rains. Surface soil layer remains sufficiently wet to make the applied fertilizer available to the plants.

The effect of FYM application along with NP fertilizer was studied during 1974-76. It was revealed that application of 10 t FYM/ha increased the maize yield by about 3 q/ha. The

beneficial effect of FYM was, however, observed at lower levels of N application only. The response to N application was observed up to 80 kg N/ha both in the presence or absence of FYM. On the other hand, the response to P application was observed only on soils testing low in available P and that too only up to 20 kg P_2O_5/ha.

In 1991-92, different combinations of organic sources, FYM and crop residues (wheat straw) were applied along with N fertilizer. Application of crop residues reduced the maize yield by about 50 percent as compared to control. However, combined application of wheat straw + FYM doubled the yield of maize compared with wheat straw alone. Highest yield was obtained when 100% of N was applied thorough N fertilizer and it was on part with application of 50% N each through FYM and N fertilizer. During initial two years, application of wider C:N ratio plant residues alone (maize stover and wheat straw) showed depressing effect. But during third year and onward, the response was encouraging.

ii) Fodder crops

Fodder crops are generally grown on marginal lands and FYM is seldom applied. Similarly, little chemical fertilizer is used for these crops and the yields are generally low. Bajra grows well in Kandi area in soils of low moisture storage. Application of N up to 50 kg/ha was found to increase the grain as well as stover yields considerably. In experiments conducted on fodder sorghum during 1978-80, the response to N was also observed up to 50 kg N/ha. Napier hybrid bajra PBN 186 responded up to 50 kg N/ha applied after each cutting. This perennial source of fodder gives 3-4 cuttings a year and remains in the field upto 4 years.

iii) Sugarcane

The results of systematic experiments conducted for six years (1993-94 to 1995-96 and 1996-97 to 1998-99) revealed that without any fertilizer application, the cane yield was just half compared to application of fertilizers (Table 37). Application of 12.5 t FYM/ha increased cane yield by more than 100 q/ha over no FYM. The response to N was observed up to 100 kg N/ha with and without FYM treatment.

iv) Blackgram and Greengram

Among green gram cultivars, SML 668 and ML 818 performed equally well and were significantly superior to ML 613. Combined application of N and P fertilizers gave significantly higher yield over control (Table 38). But, higher dose of P (40 kg P_2O_5/ha) with recommended

dose of N had no significant effect on yield over lower dose of P (20 kg P_2O_5/ha) under rainfed conditions. Hence, under raifed conditions application of P_2O_5 @ 20 kg /ha is sufficient to get optimum yield of greengram under rainfed conditions.

Table 37: Effect of organic manure and N fertilization on the yield of sugarcane (q/ha)

Year	Without FYM		With 12.5 t FYM/ha		
	No nitrogen	100 kg N/ha	No nitrogen	100 kg N/ha	
1993-94	492	623	603	717	Planted crop
1994-95	405	600	508	650	Ratoon crop
1995-96	188	485	359	645	Ratoon crop
1996-97	205	535	391	679	Planted crop
1997-98	203	531	393	663	Ratoon crop
1998-99	202	531	399	662	Ratoon crop
Mean	**223**	**551**	**442**	**670**	

Table 38: Effect of graded doses of N and P on seed yield of green gram cultivars during *kharif* season

Treatments	Seed yield (q/ha)			
	2002-03	2003-04	2004-05	Mean
Cultivars				
ML 613	4.4	4.64	5.2	4.75
ML818	-	-	7.03	7.03
SML 668	4.8	8.82	8.21	7.28
L.S.D. (P=0.05)	NS	3.27	1.44	1.90
Levels of nitrogen (kg/ha)				
N_0P_0	3.8	6.36	5.68	5.28
$N_{12.5}P_{20}$	4.3	6.88	7.13	6.10
$N_{12.5}P_{20}$	4.6	6.95	7.64	6.40
L.S.D. (P=0.05)	NS	0.26	1.44	-

4.3.2 Response of *rabi* crops to fertilizers:

i) Wheat

The magnitude of fertilizer response in wheat crop has been found vary with soil type, available water storage at seeding and seasonal rainfall.

In the early seventies, when tall wheat varieties like C 306 were under cultivation, the response to N was observed up to only 30 kg N/ha in loamy sand soil of low moisture storage capacity. However, the dwarf wheat varieties like K 227 tested during this period (1971-74) showed almost a linear response up to 120 kg N/ha in soils of high moisture storage coupled with more favourable distribution of rainfall. However, in normal years and in soils of medium moisture storage, the response was obtained up to 80 kg N/ha. Total water use also increased with N application due to deep rooting which exploited water mainly from lower layers.

Response of different newly released wheat varieties was tested under varying level of N during 1990-91 to 1995-96 (Table 39). The wheat varieties PBW 175 and PBW 2265 responded up to 80 kg N/ha and produced more yield than PBW 65. Another wheat variety, PBW 299 was included in the trials from 1993-94 onwards. However, PBW 175 showed an edge over other varieties at all the N levels tested. The yearly yield variation was due to the variation in profile water availability and seasonal rainfall.

Table 39: Response of wheat varieties to different levels of N application (grain yield, q/ha)

Year	Soil type/ wheat variety	N levels (kg/ha)					
		0	20	40	60	80	100
1972-73							
	Sandy loam soil	19.00	-	32.70	-	35.50	-
	Clay loam soil	15.50	-	32.80	-	38.50	-
1973-74							
	Sandy loam soil	23.20	-	27.60	-	33.40	-
	Clay loam soil	22.50	-	27.00	-	41.60	-
1983-84		-	19.4	-	23.0	25.2	24.7
1984-85		-	21.6	-	29.6	30.6	32.3
1985-86		-	31.8	-	41.8	44.0	45.8
1990-91							
	PBW 175 }Sandy	-	-	-	34.63	34.14	35.30
	PBW 2265}Loam	-	-	-	28.63	37.61	38.83

1991-92							
	PBW 175 }Sandy	-	-	-	19.00	23.98	25.15
	PBW 2265}Loam	-	-	-	19.15	23.95	25.80
1992-93							
	PBW 175 }Sandy	-	-	-	20.36	25.00	18.04
	PBW 2265}Loam	-	-	-	16.50	17.45	15.81
1993-94							
	PBW 175 }Loamy	11.52	17.29	19.79	-	23.12	23.19
	PBW 299 }Sand	9.93	16.02	18.08	-	21.38	27.70
1994-95							
	PBW 175 }Sandy	-	-	-	30.80	34.7	38.17
	PBW 299 }Loam	-	-	-	24.27	28.00	31.25
1995-96							
	PBW 175 }Sandy	-	-	-	24.17	29.90	33.15
	PBW 299 }Loam	-	-	-	20.26	25.50	27.60

Different sources of N fertilizer such as urea, calcium ammonium nitrate and ammonium chloride were tested on dryland wheat grown after maize. No significant difference in wheat yield was observed among these sources (Table 40). However, the effect of ammonium chloride was slightly inferior to urea and calcium ammonium nitrate. Even under the deficient soil moisture conditions, application of urea did not show any adverse effect on wheat.

Table 40: Effect of different sources of N fertilizers on wheat yield (q/ha)

Year	Urea	Calcium ammonium nitrate	Ammonium chloride
1990-91	43.57	46.83	-
1992-93	32.22	33.26	27.73
1993-94	31.03	30.83	27.00
1994-95	29.57	29.45	27.87
1995-96	24.13	23.85	22.28
Mean	**32.10**	**32.84**	**26.22**

When seasonal rainfall was low, drilling of N at sowing proved superior to broadcast or drilling one half at sowing and spraying the remaining half on the foliage. Drilling of fertilizers at some depth below the seed ensured availability of nutrients at all stages of plant growth as it is

located in the moist zone. Application through foliar spray can only be made at a later stage when the crop canopy is fully developed. Recently conducted experiments indicated that application of half of recommended N to wheat as basal and remaining half with winter rains proved economical.

Next to N, P is the nutrient element which limits crop yields in the rainfed areas. In a series of experiments during 1972-76, it was observed that the response to P was influenced by soil type as well as available P status of the soil. There was no response of tall wheat to P application and it was attributed to the medium to high available P status of the soil. However, dwarf wheat varieties responded up to 20 and 40 kg P_2O_5/ha in loamy sand and sandy loam soils respectively.

ii) Gram

Gram is sown on soils of low water storage and usually follows *Kharif* fodders. Results of experiments indicate response of gram to P application on soils testing low in available P. Application of 20 kg P_2O_5 increased grain yield by 3.5 - 5.0 q/ha.

In wheat + gram mixture, response to N was observed up to 60 kg N/ha in clay loam and sandy loam soils, whereas response was restricted only up to 20 kg N/ha in loamy sand soil. Response to P varied according to soil P status. On soils testing 16 kg available P/ha or less, significant response of 20 kg P_2O_5/ha was observed irrespective of soil type.

The seed priming of chickpea with molybdenum (Mo) significantly increased seed yield over control up to 0.50g/l and decreased thereafter. Seed priming with 0.50 g/l i.e. 500 ppm of Mo gave 18% higher seed yield as compared to control (Table 42). Seed priming of chickpea with Mo improved nodulation and increased the WUE from 16-39 % as compared to control.

In an experiment conducted to study the combined effect of phosphorus, sulphur and bio-fertilizers in chickpea, application of P + S to rainfed chickpea @ 30 kg P_2O_5 + 20 kg S/ha gave highest seed yield and B:C ratio (Table 43) followed by 15 kg P_2O_5 +10 kg S/ha. Seed inoculation with *Rhizobium* gave better yield and economic returns than seed inoculation with phosphate solubilizing bacteria (PSB) and control. The seed inoculation with *Rhizobium*/phosphate solubilizing bacteria (PSB) and application of P + S @ (30 kg P_2O_5 + 20 kg S/ha) to chickpea gives higher seed yield and net returns.

Table 42: Response of rainfed chickpea to seed priming with molybdenum

Treatments	Grain (kg/ha)*					BC ratio	RWUE (kg/ha/mm)
	2009-10	2010-11	2011-12	2012-13	Mean	Mean	Mean
Control	515	1805	1109	999	1107	2.61	4.3
Seed priming with Mo @ 0.25 g/l	591	1989	1235	1132	1237	2.87	5.3
Seed priming with Mo @ 0.50 g/	626	2098	1305	1203	1308	3.00	6.0
Seed priming with Mo @ 0.75 g/l	615	2078	1298	1144	1284	2.93	5.0
Mean	587	1993	1237	1119	1234	2.85	5.2
S.Em	21	63	44	40	-	-	-
CD (0.05)	68	200	140	130	-	-	-
CV (%)	7.2	6.3	7.1	7.2	-	-	-

Table 43: Effect of phosphorus + sulphur and seed inoculation on chickpea under rainfed conditions

Treatments	Grain (kg/ha)*					Mean	Mean BC ratio	Mean WUE (kg/ha/mm)
	2008-09	2009-10	2010-11	2011-12	2012-13			
Phosphorus + sulphur								
P_0S_0	720	368	1396	790	1254	906	2.38	4.59
P_0S_{10}	766	388	1459	824	1358	959	2.47	4.96
$P_{15}S_{10}$	831	422	1543	866	1502	1033	2.59	5.49
P_0S_{20}	790	398	1508	842	1448	997	2.51	5.14
$P_{30}S_{20}$	888	443	1631	894	1595	1090	2.62	5.88
Mean	799	404	1508	843	1431	997	2.52	5.21
S.Em	32	15	40	23	34	-	-	-
CD (0.05)	91	44	115	66	99	-	-	-
CV (%)	11.9	11.4	7.9	8.1	7.2	-	-	-
Biofertilizer								
B_C	764	393	1443	813	1321	947	2.41	4.89
B_{Rz}	821	411	1550	865	1504	1030	2.61	5.36
B_{PSB}	812	406	1529	852	1471	1014	2.56	5.38
Mean	799	404	1508	843	1432	997	2.53	5.21
S.Em	24	12	31	18	50	-	-	-
CD (0.05)	NS	NS	89	NS	146	-	-	-
CV (%)	11.9	11.4	7.9	8.1	7.2	-	-	-

iii) Lentil

Seed inoculation with *rhizobium* culture increased the seed yield of lentil by 20.3% over uninoculated seed. Application of 6.25 kg N + 20 / kg P_2O_5 ha resulted in significantly higher seed yield as compared to 6.25 kg N + 10 kg P_2O_5/ha (Table 44). However, the further increase in phosphorus level did not register any significant yield advantage. Thus, seed inoculation with *rhizobium* culture and fertilizer application of N @ 12.5 kg and P_2O_5 @ 20 kg/ha is giving higher seed yield and is recommended for the crop.

Table 44: Effect of *rhizobium* seed inoculation and graded levels of nitrogen and phosphorus on the productivity of lentil.

Treatments	**Seed yield (kg/ha)**		
Seed inoculation	**2002-03**	**2003-04**	**Mean**
Without inoculation	5.72	4.89	5.31
With inoculation	6.86	5.91	6.39
L.S.D. (P=0.05)	**NS**	**NS**	**-**
N and P_2O_5 levels (kg/ha)			
$N_{6.25}P_{10}$	5.71	4.46	5.09
$N_{12.5}P_{20}$	6.38	5.68	6.03
$N_{12.5}P_{30}$	6.80	6.07	6.44
L.S.D. (P=0.05)	**NS**	**1.01**	**-**

Green manuring with green gram along with RDF registered highest seed yield (903 kg/ha) with a mean per cent increase of 6.6-63.3% as compared to other treatments. Farmer's practice resulted in lowest seed (553 kg/ha) and stover (1840 kg/ha) yield. Not much variation is recored in oil content among the treatments. Therefore, application of RDF alone or in combination with organic sources of manuring proved better in terms of yield attributing charcters, seed and stover yield over farmer's practice.

iv) Oilseeds

Recently experiment on nutrient management in toria, gobhi sarson and toria + gobhi sarson intercropping was conducted and it was concluded that the application of 50 kg N/ha in toria and 75 kg N/ha in gobhi sarson crop gave 36.8% and 52.6% higher yield than control under rainfed conditions. While, in toria + gobhi sarson intercropping system, application of 30

kg N/ha to toria and 50 kg N/ha to gobhi sarson gave 30.8% higher yield (Table 45) than control (T+GS).

Table 45: To evaluate the N requirement for Toria, Gobhi Saron and Toria + Gobhi Saron intercropping system under rainfed conditions

Treatments	Grain (kg/ha)*				Mean BC ratio of all products
	2009-10	2011-12	2012-13	Mean	
Control (T)	846	269	356	490	1.25
Control (GS)	1058	350	644	684	1.59
Control (T + GS)	1436	499	940	958	2.01
40 kg N/ha (T)	1012	337	726	692	1.78
50 kg N/ha (T)	1136	402	752	775	1.98
60 kg N/ha (T)	1095	436	780	755	1.91
50 kg N/ha (GS)	1284	549	976	936	2.10
75 kg N/ha (GS)	1429	630	1003	1034	2.28
100 kg N/ha (GS)	1374	606	1048	1009	2.19
20 kg (at sowing of T) + 12.5 kg (at sowing of GS) + 12.5 kg (at harvesting of T) N/ha	1535	685	1282	1167	2.31
20 kg (at sowing of T) + 18.75 kg (at sowing of GS) + 18.75 kg (at harvesting of T) N/ha	1596	773	1330	1233	2.43
20 kg (at sowing of T) + 25 kg (at sowing of GS) +25 kg (at harvesting of T) N/ha	1634	801	1376	1270	2.48
25 kg (at sowing of T) + 12.5 kg (at sowing of GS) + 12.5 kg (at harvesting of T) N/ha	1565	720	1272	1186	2.34
25 kg (at sowing of T) +18.75 kg (at sowing of GS) +18.75 kg (at harvesting of T) N/ha	1626	851	1402	1293	2.54
25 kg (at sowing of T) + 25 kg (at sowing of GS) + 25 kg (at harvesting of T) N/ha	1679	860	1468	1336	2.60
30 kg (at sowing of T) + 12.5 kg (at sowing of GS) + 12.5 kg (at harvesting of T) N/ha	1592	714	1340	1215	2.38
30 kg (at sowing of T) +18.75 kg (at sowing of GS) + 18.75 kg (at harvesting of T) N/ha	1655	826	1420	1300	2.56
30 kg (at sowing of toria) + 25 kg (at sowing of GS) + 25 kg (at harvesting of Toria) N/ha	1708	875	1569	1384	2.69
Mean	1403	621	1094	1040	2.19
S.Em	74	57	55	-	-
CD (0.05)	213	165	159	-	-
CV (%)	9.1	15.9	8.8	-	-

T = Toria, GS = Gobhi Sarson

v) Isabgol

In an experiemnt conducted on nutrient management in isabgol, application of recommended dose of nitrogen through organic or inorganic sources alone or in combination gave significantly higher yield as compared to control in isabgol (Table 46). The maximum seed yield (1011 kg/ha) was recorded with combined application of FYM and inorganic fertilizer (50:50 basis) and was also significantly higher than 100% N application through FYM alone. Hence, integrated nutrient management with FYM and inorganic fertilizer (50:50) is recommended for higher yield of isabgol.

Table 46: Effect of organic and inorganic sources of nutrition on the seed yield of isabgol under rainfed conditions

Treatments	Yield (kg/ha)	
	Seed	Stover
Control	677	2078
100% inorganic fertilizer	917	2948
100% farm yard manure (FYM)	881	2457
100% vermin-compost	921	2569
100% subabul green leaves	969	2833
50% FYM + 50% subabul green leaves	990	2854
50% FYM + 50% vermin-compost	922	2693
50% FYM + 50% inorganic fertilizer	1011	2896
50% vermin-compost + 50% subabul green leaves	928	2623
50% FYM + 50% vermin-compost + 50% subabul green leaves	940	2779
L.S.D. (P=0.05)	**98**	**285**

4.3.3 Fertilizer management in maize-wheat cropping system

Generally, fertilizer recommendations are made for individual crops whereas the crops are grown in a sequence. The fertilizer requirement of a cropping system is different from individual crops because of the possible residual effect of the fertilizer applied to the individual crop. This residual effect under limited water conditions is likely to be more and there can be

saving of fertilizer for the following crop. Therefore, field experiments were conducted to find out the optimum dose of fertilizers including organic manures in maize-wheat cropping system.

In field experiments conducted during 1977-80, the maize crop responded significantly to application of 15 t FYM/ha from the second year onwards when the rainfall was good and yields were higher (Table 47). The residual effect of FYM applied to maize was also observed on the following wheat crop. Recent trials indicated that application of FYM @ 10 t/ha benefited either maize or wheat depending on the wetness of the season. During years of normal rainfall, both crops were equally responsive to FYM application. Response to N was obtained up to 60-80 kg N/ha but the maximum response was obtained at the initial level of N application i.e. 40 kg N/ha. The results suggest that in maize-wheat sequence when FYM is applied to maize, a saving of 50% N can be made in case of the following wheat crop.

Table 47: Direct and residual effect of organic manure application in maize-wheat sequence

Year	Maize yield (q/ha)		Wheat yield (q/ha)	
	No FYM	**FYM**	**No FYM**	**FYM**
1974	28.5	31.1	-	-
1975	26.8	29.1	-	-
1976	18.2	19.6	-	-
1977-78	14.8	15.6	39.9	41.3
1978-79	14.6	21.7	38.7	42.1
1978-80	11.3	13.0	20.6	21.1
1983-84	27.3	37.7	22.6	28.0
1984-85	36.3	37.2	27.9	28.5
1985-86	24.7	30.2	34.5	43.5
1986-87	32.4	33.3	31.7	31.5
1988-89	9.2	10.9	38.4	40.9
1991-92	-	-	19.1	19.2
1993-94	-	-	15.8	17.7
Mean	**22.2**	**25.4**	**28.9**	**31.4**

Application of FYM significantly increased maize yield in low and medium P soils. Response to P application in maize as well as wheat was observed only in low P soil and the residual effect of FYM and P applied to maize was not observed on wheat. Wheat crop responded up to 20 kg P^2O^5/ha but there was no residual effect of P applied to maize on wheat. Long time application of P to wheat showed its residual effect on the following maize crop.

Integrated nutrient management practices in maize/mash-wheat/lentil cropping system under dryland conditions

Application of inorganic nutrients though gives potential yield but deteriorates soil health. Conjunctive use of organic nutrients with inorganic ones can help in restoring the soil health and maintaining the yield levels. Therefore, field experiments were conducted to evaluate green leaves, FYM and urea as nitrogen sources for maize and wheat crops and their effect on succeeding crops of blackgram and lentil. Nitrogen was applied as per treatment through these sources in maize and wheat and no application in mash and lentil and phosphorus was applied as per recommendation to all crops.

In maize/mash-wheat/lentil cropping system, highest grain yield was observed in maize and wheat (Table 48) with the application of 100% recommended N (80 kg N/ha) through urea alone inorganic fertilizer which was at par with 15 kg N through compost/green leaf in combination with 10-20 kg N through urea treatments, thus saving of 45 kg N/ha. The data further indicate that application of 25 kg N through compost gave statistically at par yield with 50% recommended N through inorganic fertilizer. There was no prominent residual effect of different treatments applied to previous crops (maize wheat) on the yield of succeeding crops (mash and lentil) but these treatments were superior over control.

In an experiment conducted to optimize the dose of FYM and fertilizers in maize-wheat cropping system, it was concluded that application of 6 t/ha FYM + 40 kg N/ha (urea) to maize and 60 kg N/ha (urea) to wheat gave maize yield and wheat yield which were statistically at par with yields from application 12 t/ha FYM + 40 kg N/ha (urea) to maize and 60 kg N/ha (urea) to wheat. Thus, this treatment reduces the cost of cultivation and quantity of inputs.

Table 48: Effect of integrated nitrogen management in maize and wheat and its effect on succeeding crops of blackgram and lentil in maize/mash-wheat/lentil cropping system under dryland conditions (Mean of 5 years 2003-04 to 2006-07)

Treatments	Yield (q/ha)			
	Maize	Wheat	Blackgram	Lentil
T_1 : Control	15.6	13.1	4.7	5.92
T_2 : 100% of recommended N through inorganic fertilizer	28.2	20.3	7.2	7.49
T_3 : 50% of recommended N through inorganic fertilizer	23.2	17.0	6.2	6.77
T_4 :25 kg N/ha through compost	23.8	16.9	6.1	6.94
T_5 : 15 kg N/ha through compost + 10 kg N/ha through inorganic fertilizer	27.7	19.3	6.6	7.45
T_6 : 15 kg N/ha through compost + 20 kg N/ha through inorganic fertilizer	26.7	20.2	6.9	7.57
T_7 : 15 kg N/ha through green leaf + 10 kg N/ha through inorganic fertilizer	25.5	18.2	6.4	7.17
T_8 : 15 kg N/ha through green leaf + 20 kg N/ha through inorganic fertilizer	27.0	19.6	6.7	7.91
T_9 : 15 kg N/ha through compost + 10 kg N/ha through green leaf	23.5	17.3	6.2	7.24
C.D. (P=0.05)	2.83	2.53	0.826	0.661
CV	8.9	10.9	10.1	7.1

Table 49: Integrated nutrient management practices in maize-wheat cropping system under dryland conditions

Treatments		**Grain (kg/ha)***				**Mean BC ratio of all products**
Kharif	***Rabi***	**2007-08**	**2008-09**	**2009-10**	**Mean**	
Maize						
Control	Control	2850	2346	2486	2561	1.94
80 kg N/ha urea (U)	80 kg N/ha (U)	4070	4105	4407	4194	2.90
FYM @ 6 t/ha	80 kg N/ha (U)	3130	3212	3414	3252	2.15
FYM @ 12 t/ha	80 kg N/ha (U)	3250	3429	3465	3381	1.84
FYM @ 6 t/ha + 40 kg N/ha (U)	80 kg N/ha (U)	3690	3650	4127	3822	2.31
FYM @ 6 t/ha + 40 kg N/ha (U)	60 kg N/ha (U)	3720	3694	4088	3834	2.31
FYM @ 12 t/ha + 40 kg N/ha (U)	80 kg N/ha (U)	3890	3771	4247	3969	1.96
FYM @ 12 t/ha + 40 kg N/ha (U)	60 kg N/ha (U)	3930	3817	4222	3990	1.96
	Mean	3566	3503	3807	3625	2.17
	S.Em	154	252	179	-	-
	CD (0.05)	730	764	542	-	-
	CV (%)	12.2	12.5	8.1	-	-
Kharif	***Rabi***					
Wheat						
Control	Control	897	1425	1359	1227	1.43
80 kg N/ha urea (U)	80 kg N/ha (U)	1410	1732	1718	1620	1.74
FYM @ 6 t/ha	80 kg N/ha (U)	1487	1578	1647	1571	1.67
FYM @ 12 t/ha	80 kg N/ha (U)	1533	1623	1707	1621	1.65
FYM @ 6 t/ha + 40 kg N/ha (U)	80 kg N/ha (U)	1766	1807	1745	1773	1.83
FYM @ 6 t/ha + 40 kg N/ha (U)	60 kg N/ha (U)	1610	1745	1668	1674	1.78
FYM @ 12 t/ha + 40 kg N/ha (U)	80 kg N/ha (U)	1788	1967	1809	1855	1.85
FYM @ 12 t/ha + 40 kg N/ha (U)	60 kg N/ha (U)	1695	1908	1763	1789	1.81
	Mean	1523	1723	1677	1641	1.72
	S.Em	101	79	77	-	-
	CD (0.05)	272	240	234	-	-
	CV (%)	18.8	8.0	8.0	-	-

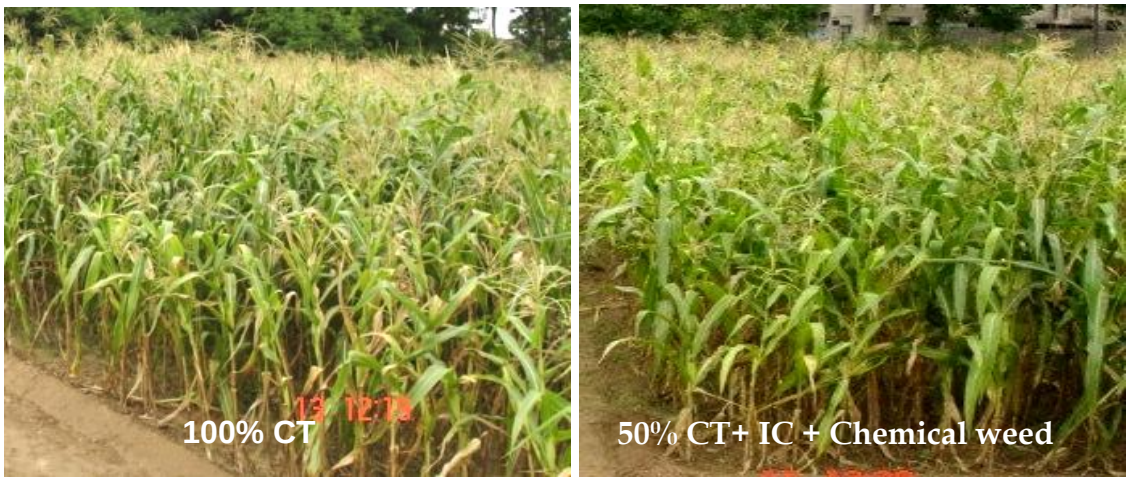
4.4. Long term experiments

4.4.3 Tillage and nutrient management

In maize-wheat rotation, the maize and wheat grain yield recorded with 50 % conventional tillage (CT) + interculture (IC) + chemical weed control were at par with CT + IC, thus saving two tillage operations. Thus, there is reduction in operational cost without change in yield. Among nitrogen sources, application of 100% N through urea gave highest grain yield as well BC ratio and rain water use efficiency in maize and wheat.

Table 50: Effect of tillage and sources of nitrogen on the crop productivity of maize-wheat cropping sequence under dryland conditions (Mean of 12 years)

Treatments	Mean grain yield (kg/ha)	Mean BC ratio	Mean RWUE (kg/ha/mm)
Tillage Practice	**Maize**		
Conventional tillage (CT) + interculture	2252	1.51	4.86
50 % CT + interculture (IC)	1955	1.43	3.95
50 % CT + IC + chemical weed control	2272	1.62	4.61
L.S.D. (P=0.05)	244		
Source of Nitrogen			
100 % N organic source (OS)	1916	1.17	3.77
50 % N (OS) + 50 % N inorganic source (IS)	2179	1.56	4.68
100 % N (IS)	2380	1.83	4.97
L.S.D. (P=0.05)	217		
Tillage Practice	**Wheat**		
Conventional tillage (CT) + interculture	2125	1.67	10.14
50 % CT + interculture (IC)	1937	1.68	9.18
50 % CT + IC + chemical weed control	2079	1.79	9.73
L.S.D. (P=0.05)	289		
Source of Nitrogen			
100 % N organic source (OS)	1906	1.41	9.03
50 % N (OS) + 50 % N inorganic source (IS)	2090	1.71	9.63
100 % N (IS)	2144	2.03	10.39
L.S.D. (P=0.05)	231	**-**	**-**



4.5 Crop improvement/Evaluation of drought tolerance varieties (PVS)

4.5.1 Suitable varieties of crops

Several varieties of different crops were evaluated over the years and promising crops and crop varieties have been identified in terms of their suitability, yield performance and for other attributes under rainfed conditions.

4.5.1.1 Kharif season

i) Maize

Local varieties of maize are grown on considerable area because the hybrids and composites introduced in the early years gave almost the same yield. The local varieties are drought tolerant or perform better under water-logging condition and gave reasonably good yields. Residual soil moisture at harvest was higher under local maize than hybrid varieties, particularly when monsoon rains receded early. Local varieties matured 10-12 days earlier and left more residual soil moisture for the succeeding *rabi* crop. Higher residual moisture due to early harvest of local maize resulted in a good germination and stand of *rabi* crops. Therefore, local maize was the most suitable variety til early eighties when *rabi* crop was grown after maize.

During the 1990s, extensive field trials were conducted and composite varieties of maize, such as Megha and Kesari were found superior to the local varieties. But in beginning of twenty first century the composites got replaced by the early maturing maize hybrid such as Parkash, JH 3459 and PMH 2 for cultivation under rainfed conditions.

ii) Bajra

Pearlmillet variety HB-1 found superior during the seventies and then PHB 47, PCB 8, PHB 10, PCB 15 and PCB 138 were released for cultivation during the eighties till the twentieth century. During the beginning of twenty first century PCB 164 and PHB 2168 were recommended for grain purpose, whereas FBC 16 and PHBF 1 (hybrid) for fodder purpose and these varieties replaced the earlier varieties.

iii) Oilseeds

In an advanced varietal trial conducted during 1993-94, sesamum strain IVI 24 recorded significantly higher yield than the check TC 289. Sesamum strains, IVI 2, IVI 4, IVI 8 and IVI 18 were identified as high yielders compared to checks, Punjab Til No. 1 and TC 289. RT 346 from Rajsthan was recommended for cultivation in the state and this variety replaced the earlier varieties due to more yield, white and bold grains.

iv) Pulses

a) Mash

Mash 1-1 found promising during the seventies and thereafter Mash 48 was released for cultivation and now this variety got replaced by better yielding varieties Mash 338 and Mash 114.

b) Moong

ML 131, ML 267 were the earlier varieties those got replaced by ML 613 and ML 818 and PAU 911 under rainfed conditions.

***4.5.1.2 Rabi* season**

i) Wheat

Tall wheat variety C 306 out-yielded the dwarf varieties evaluated during late seventies on loamy sand soils in years of below normal rainfall. However, in years of normal rainfall, the high-yielding dwarf varieties, WG 357, WL 410 and PBW 2265 gave more yield on both loamy sand and sandy clay loam soils. The yield levels of different varieties varied widely in different years due to the fluctuating rainfall pattern. Therefore, high yielding varieties of wheat have higher yield potential when profile water storage was inadequate and rainfall occurrence was

normal. However, tall wheat variety C 306 fared better in soils of low moisture storage particularly in low rainfall years.

The experiments conducted during the last 20 years have resulted in identification of high yielding wheat varieties such as: PBW 175, PBW 299, PBW 527, PBW 644 and more recently PBW 660 for cultivation under rainfed conditions.

ii) Barley

Till late seventies no variety could show superiority over local varieties under rainfed conditions. In recent years, the varieties PL 426, PL 56 and PL 419 found suitable and recommended under rainfed conditions.

iii) Pulses

Gram was the most important pulse crop grown till early eighties in the *Kandi* and the variety C 235 found more suitable than other varieties tested. In the recent years three more varieties PBG 1, PBG 5 and PBG 7 were evaluated and released for cultivation under rainfed conditions. Lentil variety L 9-12 gave good yield on sandy loam soils during the earlier years but now this variety was replaced by LL 699 and LL 931 giving significantly higher yields.

iv) Oilseeds

Among the varieties of raya, RL 18 and T 59 found superior during the earlier years. Lately PBR 91, PBR 97 and RLM 619 were tested and released for cultivation under rainfed conditions. During drought years, TMLC 2 variety of taramira gave better yield than raya on light textured soils. On heavy soils, LC 54 variety of linseed performed well. Taramira has advantage that this crop is also suitable for cultivation under animal damage prone areas due to less preference by the animals.

Safflower thrives well in rainfed dryland conditions. This crop is likely to catch the interest of the farmers of this region. The strains ISF-1, SPP-A-129 and MKH-9 found superior to local check, Bhima. The yield of safflower varied from 6-9 q/ha. The crop has thorns and is not damaged by wild animals.

Recently work has been initiated for the evaluation and recommendation of the dual purpose varieties of cereals and pulses, keeping in view the acute shortage of fodder for the

dairy animals in this region as the dairy farming are one of the major farming components in this part of the state.

4.6. Energy management/ Farm mechanization

The Conventional tillage gave better results than rotavator in maize and wheat crops. Highest grain yield as well as BC ratio and RWUE in maize and wheat was recorded with conventional tillage. Among nitrogen sources, maize crop gave highest grain yield, B:C ratio and RWUE with 80 kg/ha N through urea. However, in wheat with integrated use of 40 kg N/ha (compost) + 40 kg N/ha (inorganic-Urea) gave 11.3% higher grain yield (1868 kg/ha) over recommended dose 80 kh N/ha through urea.

Table 51: Effect of Rotavator and INM on maize-wheat cropping system under rainfed conditions

Treatments	**Grain yied (kg/ha)**		**Mean grain yield (kg/ha)**	**Mean BC ratio**	**Mean RWUE (kg/ha/mm)**
	2011-12	**2012-13**			
Tillage Practice		**Maize**			
T_1: Conventional tillage (CT)	2446	2771	2609	1.85	5.26
T_2: Rotavator (RTV)	1927	1905	1916	1.65	3.78
L.S.D. (P=0.05)	325	332	-	-	**-**
Source of Nitrogen					
F_1: Control	1669	1444	1556	1.35	3.01
F_2: 40 kg N/ha (inorganic-Urea)	2226	2475	2351	1.92	4.73
F_3: 80 kg N/ha	2802	2878	2840	2.22	5.64
F_4: 20 kg N/ha (compost) + 20 kg N/ha (inorganic-Urea)	1944	2134	2039	1.57	4.09
F_5: 40 kg N/ha (compost) + 40 kg N/ha (inorganic-Urea)	2327	2674	2501	1.77	5.06
F_6: 20 kg N/ha (compost) + 20 kg N/ha (green leaf)	2154	2423	2289	1.66	4.61
L.S.D. (P=0.05)	246	209	-	-	**-**
Tillage Practice		**Wheat**			
T_1: Conventional tillage (CT)	1293	2062	1677	1.45	11.5
T_2: Rotavator (RTV)	970	1800	1385	1.40	9.4

L.S.D. (P=0.05)	215	NS	-	-	**-**
Source of Nitrogen					
F_1: Control	788	1384	1086	1.22	7.4
F_2: 40 kg N/ha (inorganic-Urea)	1218	2019	1619	1.58	11.0
F_3: 80 kg N/ha	1277	2037	1657	1.60	11.3
F_4: 20 kg N/ha (compost) + 20 kg N/ha (inorganic-Urea)	1096	1929	1513	1.39	10.3
F_5: 40 kg N/ha (compost) + 40 kg N/ha (inorganic-Urea)	1388	2349	1868	1.54	12.7
F_6: 20 kg N/ha (compost) + 20 kg N/ha (green leaf)	1022	1868	1445	1.24	9.8
L.S.D. (P=0.05)	94	227	-	-	**-**

4.7 Alternate land use system

4.7.1 Agro forestry

To stabilize income of farmers under rainfed conditions, agroforestry systems are considered more economical compared to growing field crops alone. In case the crops fail, the farmers get some income from the trees. Due to this reason, agroforestry has been adopted by the farmers of the area. There are natural agroforestry systems integrating staggered trees in the cultivated lands. Systematic experiments conducted on agroforestry under rainfed conditions have resulted in the identification of suitable tree species, their planting distance and companion grain or fodder crops. Planting of Kikar (*Acacia nilotica*) and safeda (*Eucalyptus sp.*) in blocks at 3x5 m spacing showed good performance. At this spacing, plant height and girth of trees were maximum. On light textured soils and soils affected by choes, cultivation of fodder crops during *Kharif* and oilseed crops during *rabi* was found to be the most suitable rotation. The yield of these crops was not affected by growing them with either safeda or kikar trees for many years. The growth performance of trees was also not affected by the cultivation of grain or fodder crops. In fact the yield of fodder crops was higher when trees were grown in the field compared to no-tree system. The fertility of the soil was also improved. The organic carbon content in the surface layer of soils was higher in plots of Kikar and Safeda.

4.7.2 Agro-horticulture


Gauva + Taramira


Gauva + Lentil

The climate of Kandi area is suitable for cultivation of horticultural crops such as aonla, galgal, ber, guava and mango. The planting of these horticultural trees at a distance of 7.5x7.5 m showed the best performance. Intercropping with leguminous crops did not affect the growth of fruit trees adversely. These crops improved soil fertility and also checked runoff and soil erosion. The cultivation of these crops can be done successfully up to the age of 4 years of horticultural crops. The grasses could also be grown successfully as intercrops in the orchards.

Development of agro-horticulture model with the efficient use of water

The Fruit based agroforestry systems like Amla+blackgram, Gauva+blackgram during *kharif* and Amla + taramira, Gauva+ Taramira, Amla + lentil, Gauva+ lentil during *rabi* were evaluated and were found efficient in providing higher yield and economic returns than annual crops in rainfed areas.

5. Externally funded projects

i) Completed

Sr.No.	Project Title	Project cost (lac Rs.)
1	Farmers participatory research action programme (FPARPs)	50.0
2	On Farm Water management for rainfed agriculture on benchmark watersheds in diverse eco-regions of India.	1.5
3	Capacity building of staff of Punjab State Forest Department in technical, social, participatory aspects of forest management	47.0
4	Studies on carbon sequestration under different farm/agro-forestry interventions	30.0
5	DST New Delhi sponsored adhoc research project “Behaviour and Pattern of gully erosion in foothills of lower Shiwaliks and their management”	15.0
6	Consultancy for the “Evaluation of four water harvesting structures under Integrated Watershed Development Project Punjab.	3.0
7	DST, New Delhi sponsored adhoc research project “Evaluation of gully control measures in foothills of lower Shiwalik.”	1.5
8	Consultancy for the “Evaluation of two water harvesting reservoirs constructed in village Bharauli and Ibrahimpur under Haryana Community Forest Project” SPACE Chandigarh	2.9
9	Development of cost- effective technology for treatment of choes (rainy season torrents).	31.3
10	On Farm applied research under I.W.D.P. (Hills) *Kandi* plan I, phase-II	90.0
11	Nutrient management practices for important oilseed based cropping systems for improving yield and output under rain fed conditions	21.3
12	Improving productivity of rainfed maize based cropping system with rain water management on watershed basis.	17.0
13	Resource characterization and socio – economic constraint analysis of productivity in the Maize based cropping system	5.6

14	Coordination Actions in support of sustainable & eco efficient short rotation forestry in CDM / JI countries.	35.0
15	Sustainable livestock based farming system for livelihood security in Hoshiarpur District of Punjab	56.0
16	Community managed bio-industrial watersheds for sustainable use of natural resources and enhanced livelihood	31.4
17	Gully erosion management in foothills of lower Shiwaliks	19.0
18	Development and demonstration of runoff farming system on micro-watershed basis in the foothills of lower Shiwaliks	28.8

ii) Ongoing Adhoc Research Project

Sr.No.	Name of project	Sponsoring Agency	Duration	Project cost (Lac Rs.)
1	National Initiative on Climate Resilient Agriculture (NICRA)	CRIDA, Hyderabad	2010 onwards	61.3
2	Integrated approaches to conserve the natural resources for sustainable development & to mitigate the effect of climate change in participatory mode under Sustainable Agriculture and Rural Transformation Holistic Initiative (SARTHI)	DST New Delhi	2014 - 17	26.4

6. On Farm Trials

6.1 Soil and water conservation measures

`An ideal soil and water conservation system suitable to soil, climate and crops may not be feasible under the existing socio-economic conditions of the farmers. Dryland farmers of the *Kandi* region are having numerous and diverse problems and limitations. An appropriate system is one which is most suitable for farmers and executing agencies for its adoption that can fulfill the conservation and sustain production objectives to maximum extent. Apart from engineering factors related to soil, topography and climate, other factors related to society, farmers and crops are to be considered while designing and executing soil and water conservation works. Whenever possible, engineering designs are to be modified to suit the local and socio-economic conditions and preferences of the farmers.

Cultivated lands on steep slopes are in small patches and its complete development for cultivation requires terracing and safe disposal of excess surface runoff. Simple terracing and leveling without proper disposal structure do not serve the purpose and sometimes accelerate soil erosion. Studies suggest that non-arable lands with slopes greater than 8% should not be terraced and leveled to bring under cultivation. Such lands should rather be developed under plantations and maintained under permanent vegetation cover.

Two representative sub-watersheds having similar soil and topographical characters were selected in village Boothgarh for developing an appropriate soil and water conservation technology. One of these watersheds was left as control and other was taken up for development. After analyzing the problems of this sub-watershed, the traditional methods of farming, specific crop needs for minimum earth work and feasibility of further division of fields among family members, it was concluded that terracing of fields was needed at a few locations. Minor land grading, bunding, safe disposal of excess runoff during intense monsoons from each field and drainage of runoff from field to permanent waterways were essential to check soil erosion, and conserve moisture.

After these land development works, the value of land increased substantially and the farmers started taking more interest in farming. They started taking grain crops and adding more fertilizers. Land treatment with soil and water conservation measures increased the yields of wheat + gram mixture and bajra fodder by 57 and 25% over the untreated plots

respectively. This increase in yield was mainly attributed to the increased efficiency of applied inputs and availability of soil moisture as a result of soil and water conservation measures.

6.2 Crop management

The following crop management practices were demonstrated to remove the inherent weaknesses of the traditional cultivation practices and for increasing and stabilizing crop yields:

i. Selection of suitable crop sequences and varieties
ii. Control against termite incidence
iii. Sowing method and row spacing for maize and wheat
iv. Use of mulch in standing maize
v. Control of weeds in maize
vi. Optimum fertilizer use

The recommended inputs of improved technology were individually evaluated vis-à-vis farmers' traditional practice through a series of operational research trials conducted on farmers' fields indifferent villages of the area for testing their viability, need for modification and obtaining a feedback.

6.2.1 Suitable crop sequences and varieties

Research trials had shown that soils of high and medium water holding capacity were suitable for double cropping such as maize-wheat system. In case of residual soil moisture after *kharif* crop, raya in *rabi* was found most profitable. On light soils with low water holding capacity (loamy sand and sandy soils), single *rabi* crop of wheat, gram or wheat + gram mixture after keeping fallow during monsoon was found to be more profitable than double cropping.

Traditional crop choice of farmers and improved crop selection were evaluated during *rabi* using optimum inputs. Different crop combinations were tried after maize and fodder with inter-cropping of raya in rows in wheat, gram or wheat + gram mixture during *rabi*. It was found that cropping of wheat after maize in sandy loam and loam soils and wheat + gram mixture with raya rows after *kharif* fodder in loamy sand and sandy soils were more beneficial.

Intercropping of moong in maize gave 1.5 – 2.0 q/ha moong grains in addition to normal yield of maize. Two to three rows of pearl millet around maize crop not only saved maize crop from the damage of human and animal but also provided additional yield of pearl millet.

Intercropping of raya (1.5-2.0 m apart) in the main crop of wheat was evaluated after *kharif* maize (Table 52). Raya grown as intercrop had no effect on the total yield of crops, rather it was bonus to the farmers. Although the grain yield of wheat in pure stand was maximum, the total returns were highest when raya was grown along with wheat. Growing of pure crop of raya did not appear to be profitable. Raya intercropping (2.0 m apart) in the main crop of lentil was evaluated and found profitable.

Table 52: Performance of different crops after *kharif* maize (grain yield, q/ha)

Year	Wheat	Wheat + Raya
2004-05	37.7	34.3+ 2.40
2005-06	12.11	9.34+1.86
2006-07	31.47	27.72+3.13
2007-08	30.02	25.65+3.49
2008-09	20.94	19.63+2.36
2009-10	0.0*	0.0*+2.50
2010-11	23.93	20.15+380
2011-12	19.80	17.67+1.85
2012-13	24.50	21.00+2.50

In addition to intercroping of wheat with raya, intercropping of toria with gobhi sarson was also tried at farmer's field and it gave excellent results as there is no competition between the two crop due to different growth behaviour and periods of the two crops. The net returns under this intercropping system were also higher.

Table 53: Performance of toria and gobhi sarson intercropping

Year	Toria	Toria + Gobhi sarson	Gobhi sarson
2007-08	969	625+750	-
2008-09	983	733+630	-
2009-10	600	500+255	-
2010-11	702	500+300	756
2011-12	497	344+535	667

2012-13	533	1090	850

In the light-textured soils having basically low fertility, experiments on growing of green manure crop in the fallow lands were conducted. The crop was sown with the pre-monsoon showers and ploughed in the soil sometime during mid-August at the age of 40 days. The green manure crop provided a good soil cover during intense monsoon period, checked soil erosion and also improved soil fertility. This practice was quite effective in the fallow fields and increased wheat yields considerably.

Trials for evaluation and development of drought tolerant varieties of different crops are being conducted at AICRPDA centre and on the farmers' fields of ORP villages (Table 54).

Table 54: Recommended crop cultivars for rainfed condition since inception of AICRPDA centre

Crop	Cultivars
Maize	Navjot, Kesari, Megha, Parkash, JH 3459, PMH 2
Bajra	PHB 47, PCB 8, PHB 10, PCB 15, PCB 138, PCB 164 and PHB 2168
Sesamum	Punjab Til No.1, TC 289, RT 346
Moong	ML 131, ML 267, ML 613, ML 818 & PAU 911
Wheat	PBW 175, PBW 396, PBW 299, PBW 527, PBW 644 & PBW 660
Groundnut	M 37, M 145, PG 1, SG 99
Gram	G 543, C 235, PBG 1, PBG 5 & PBG 7
Raya	RLM 619, RLM 514, PBR 97
Lentil	LL 9-12, LL 699 & LL 931
Taramira	TTSA and TML C-2
Mash	Mash 48 and Mash 1-1, Mash 114 & Mash 338
Napier hybrid bajra (fodder)	PBN 186 & PBN 233

The grain yield of improved varieties of maize like Megha, Kesari and Ageti 76 has not shown a definite and consistent increase over the local varieties. However, trials with hybrids

(Parkash, JH 3459 & PMH 2) have recorded a yield of 34 - 39 q/ha, which was 13 - 20% more than composite varieties (Table 55a & 56b).

Table 55a: Yield performance of different maize varieties (grain yield, q/ha)

Year	Varieties			
	Megha	**Ageti 76**	**Parkash**	**Local**
1990-91	30.2	33.6	-	33.4
1991-92	22.3	20.1	-	19.3
1992-93	23.8	20.4	-	18.7
1993-94	17.5	-	-	16.6
1994-95	15.5	-	-	13.4
1995-96	16.0	-	21.2	16.2
1996-97	20.8	-	26.5	19.1
1997-98	18.2	-	23.2	14.7
1998-99	20.2	-	25.7	17.8
1999-2000	24.7	-	27.5	17.4
Mean	**20.9**	**24.7**	**24.8**	**18.4**

Table 55b: Yield performance of different maize varieties (grain yield, q/ha)

Year	Megha	PMH 1	Parkash	JH 3459	PMH2	Local
2003-04	26.39					19.05
2004-05	14.76	-	24.73	27.46		10.37
2005-06	18.87		28.67	30.56	29.19	12.47
2006-07			15.35	13.02	12.69	10.20
2007-08			28.63	34.45	36.28	20.11
2008-09		45.50	28.33	38.15	40.50	
2009-10			25.04	21.11		16.64
2010-11			37.46		43.33	30.00
2011-12		47.63	37.41	44.37		28.78
2012-13			34.40	38.26		29.58

Among the wheat varieties, PBW 175, PBW 644 & PBW 660 (Table 56a & 56b) have shown a definite edge over other varieties and has been widely accepted/are being accepted

by the farmers for cultivation under rainfed conditions. Similarly, varieties have been recommended for oilseeds and pulses after evaluation at this centre. Sesame variety RT 346 (Table 57) and raya variety RLM 619 (Table 58) has become popular among the farmers due to their yield potential.

Table 56a: Performance of different wheat varieties (grain yield, q/ha)

Year	Varieties			
	WL 2265	**PBW 65**	**PBW 175**	**PBW 299**
1990-91	32.4	32.6	37.7	-
1991-92	43.2	43.9	44.8	-
1992-93	32.7	32.4	35.9	-
1993-94	-	-	27.5	21.6
1994-95	-	-	34.6	28.0
1995-96	-	-	29.9	25.5
1996-97	-	-	31.4	28.3
1997-98	-	-	33.0	30.3
1998-99	-	-	33.8	30.7
1999-2000	-	-	18.7	15.3
Mean	**36.1**	**36.3**	**32.7**	**25.7**

Table 56b: Performance of different wheat varieties (grain yield, q/ha)

Year	Varieties								
	PBW 343	**PBW 373**	**PBW 175**	**PBW 502**	**PBW 527**	**TL 1210**	**PBW 644**	**HD 2967**	**Local**
2003-04	23.13	20.00	26.25	-	-	-	-	-	20.75
2004-05	30.78	-	32.96	28.01	-	-	-	-	38.72
2005-06	9.34	-	10.84	-	9.34	-	-	-	-
2006-07	-	-	30.14	-	31.13	22.80	-	-	-
2007-08	-	-	20.76	-	18.80	17.90	-	-	-
2008-09	-	-	25.59	-	20.00	-	-	-	-
2009-10	-	-	26.59	-	19.18	-	-	-	1664
2010-11	13.97	-	18.75	-	16.75	-	-	-	-
2011-12	-	-	19.64	-	-	-	-	-	16.67
2012-13	-	-	22.67	-	-	-	25.41	23.25	17.29

Table 57: Yield performance of different sesame varieties (grain yield, q/ha)

Year	Varieties		
	TC 289	**Pb til -1**	**RT 346**
2003-04	478	443	-
2004-05	356	240	-
2006-07	317	298	-
2010-11	310	286	333
2011-12	264	250	304
2012-13	235	-	290

Table 58: Yield performance of different raya varieties (grain yield, q/ha)

Year	Varieties		
	RLM 619	**PBR 97**	**Local**
2007-08	625	543	
2008-09	917	889	
2009-10	622	511	
2011-12	784	694	
2012-13	844	767	580

6.2.2 Control against termite incidence

During *rabi* season, wheat is a major crop. Cultivation of wheat is exclusively dependent on residual soil profile moisture. Due to inadequate quantity of water in the seed zone layer, wheat seed is badly damaged by termite attack which results in heavy reduction in wheat yield.

Termite incidence is a major problem in the early growth stages and its control is a prerequisite for optimum plant population. Use of BHC was tested in maize but its application showed no definite advantage. However, trials conducted over the years indicate increase in wheat yield by 4.3 to 45.0% over control with seed treatment with aldrin or chloropyriphos @ 4 ml/kg seed. Improvement in crop stand and increase in yield of groundnut and gram crops have also been recorded using treated seed with these insecticides (Table 59). Seed treatment is a low-cost input and is considered essential for maintaining desired plant population.

Table 59: Effect of seed treatment with Aldrin or chloropyriphos on grain yield of different crops (q/ha)

Year/crop	Treated	Untreated	% increase
1976-77			
Wheat	16.1	11.1	45.0
1977-78			
Wheat	17.3	12.9	34.1
1978-79			
Wheat	32.3	28.7	12.5
1979-80			
Wheat	12.0	10.7	12.1
1980-81			
Wheat	26.0	21.8	19.3
1981-82			
Wheat	41.3	38.1	8.4
1990-91			
Wheat	30.3	23.8	27.3
1991-92			
Wheat	48.7	46.7	4.3
1992-93			
Wheat	43.0	37.3	15.3
Gram	16.9	14.4	17.4
1993-94			
Wheat	27.1	22.3	21.5
Groundnut	11.6	7.2	61.1
1994-95			
Wheat	27.1	22.7	19.4
Groundnut	10.2	8.7	17.2
1995-96			
Wheat	28.8	23.6	22.0
1996-97			
Wheat	30.8	24.6	25.2
1997-98			
Wheat	30.2	24.3	24.3
1998-99			
Wheat	30.3	24.9	21.7
1999-2000			
Wheat	14.5	12.0	20.8
2000-2001			
Wheat	9.2	7.2	27.8
Mean	**27.4**	**23.1**	**21.2**

6.2.3 Sowing method and row spacing for maize and wheat

The farmers generally sow the crop in round about fashion, without any regard for slope of the land. Sowing across the slope has a definite advantage because it helps in reducing soil erosion and increasing water intake into the soil. Trials were conducted in both maize and wheat when these crops were sown in round about method and across the slope. Sowing across the slope has shown a marked increase in the yield of these crops compared with the round about method (Table 60).

Table 60: Evaluation of sowing methods in maize and wheat (grain yield, q/ha)

Year	Crop	Sowing method	
		Round about	Across the slope
1990-91	Maize	19.9	24.7
	Wheat (+Raya)	28.9 (+1.0)	34.3 (+1.2)
1991-92	Maize	22.3	30.4
	Wheat (+Raya)	44.1 (+2.1)	47.1 (+2.9)
1992-93	Maize	26.2	29.9
	Wheat	38.7	48.4
1993-94	Maize	6.3	8.2
1994-95	Maize	7.4	9.7
1995-96	Maize	18.6	24.6
	Wheat	21.2	27.4
1996-97	Maize	22.4	25.3
	Wheat	20.4	27.3
1997-98	Maize	24.8	29.2
	Wheat	24.8	28.8
1998-99	Maize	15.6	20.5
	Wheat	27.6	30.0
1999-2000	Maize	14.6	18.4
	Wheat	10.7	12.7

In maize ridge sowing and ridge sowing with tied has sown a edge over the flat sowing as in *kharif* season sometimes there are heavy rains which leads to water logging in the field.

maize is prone to water logging which results in yield losses in case of flat sowing whereas ridge sowing avoids the water logging condition and better percolation of rainwater in the soil which leads to higher yields.

Table 61: Performance of different sowing methods of maize in two way sloppy soils

Year	Flat sown	Ridge sowing without tied	Ridge sowing with tied
2009-10	25.22	38.20	46.50
2011-12	28.30	34.33	36.55
2012-13	27.92	31.25	33.33

During the sowing of *rabi* crops, there is very less moisture in the soil which leads to poor germination and ultimately crop stand in case of traditional sowing with broadcasting method. Whereas, the sowing of the *rabi* crops with seed drill leads to placement of the seed in moisture zone in the soil which leads to uniform and better germination of the crop. This results in good crop stand and ultimately higher yield of the crop (Table 62). The results of trials conducted in recent years indicated that during the year when rainfall recedes early which results in inadequate available water in seed zone (surface 5 cm layer), wheat germination gets adversely affected. In such years, deeper sowing (10 cm) of wheat with wider row spacing (30 cm) proved better than that of conventional sowing practice (5 cm deep, 22.5 cm row spacing). The available water content generally remains higher in the sub-surface soil than surface layer.

The farmers use optimum seed rate for maize but their row to row spacing is close and it makes the intercultural operations difficult. Also, there is high mortality of plants during ‘Haloding’. The recommended maize spacing of 45 x 22.5 cm was evaluated against farmers’ practice. It was found that this spacing was not possible on farmers fields. Therefore, the farmers were advised to widen the furrows to the extent it was possible without any change in the method of seed sowing by ‘Kera’. The farmers appreciated the advantage of sowing maize in wide rows (45 cm) as compared to their existing practice (30 cm). There was a significant increase in yield due to wider spacing. The farmers have adopted this practice due to the ease of intercultural operations.

The farmers use comparatively low seed rate of wheat (70-80 kg/ha) at a row to row spacing of 20-25 cm. It does not cover the risk of poor germination due to inadequate moisture in the seed zone during some of the moisture deficient years. The recommended seed rate of 100 kg/ha and row spacing of 30 cm were compared with the farmers practice. There was definite yield advantage and hence farmers were convinced about using higher seed rate and wide row spacing.

Table 62: Performance of sowing methods in wheat

Year	Crop	Yield (q/ha)			
		Seed cum fertilizer drill		Wooden plough	
		Grain	Straw	Grain	Straw
2004-05	Wheat	38.51	105.42	35.12	87.50
	Gram	13.42	31.04	9.92	25.00
2005-06	Wheat	11.88	39.20	10.09	36.50
	Chickpea	4.44	17.78	3.16	12.43
2006-07	Wheat	2112	3482	1816	3199
2007-08	Wheat	2517	-	1803	-
2010-11	Wheat	19.64	-	17.38	-
	Raya	5.48	-	3.48	-
2011-12	Wheat	18.57	-	15.71	-
	Raya	8.00	-	6.22	-
	Taramira	5.33	-	4.74	-
2012-13	Wheat	29.99	-	17.16	-
	Raya	7.98	-	6.10	-
	Taramira	6.30	-	4.70	-

6.2.4 Evaluation of weed control methods in maize

In case of maize, farmers do hand hoeing with Khurpi 15 days after sowing followed by haloding after another fortnight. Afterwards, the grasses are cut in mid-September for fodder as these compete with crop for nutrients and water. Trials were conducted to study the effect of Atrazine for controlling weeds and making more efficient use of water and nutrients (Table 63). Herbicide spray as pre-emergence effectively controlled weeds and provided nearly weed-free

conditions throughout the crop growth period. The farmers' practice i.e. one hoeing was inferior to the herbicidal control of weeds. Spectacular results with chemical weed control have impressed the farmers who have taken up this practice on a wider scale and the demand for herbicide has increased manifold in recent years. Herbicide has an additional advantage, as in some of the years; hand weeding is not possible due to continuous rains. In such years, maize is over powered by weeds.

Table 63: Effect of weed control practices on maize yield (q/ha)

Year	Control	Atrataf 50 WP @ 1.5 kg/ha	One hoeing at 15 DAS
1980	16.9	20.6	-
1991	18.1	26.9	24.4
1992	6.14	14.2	9.15
1993	14.2	23.3	19.0
1994	12.8	29.3	18.6
1995	10.5	25.7	16.5
1996	9.4	24.6	-
1997	13.6	27.5	-
1998	11.1	21.5	17.8
1999	9.6	22.3	15.6
Mean	**12.2**	**23.6**	**17.3**

6.2.5 Use of mulch in standing maize

Rabi crops are sown on residual soil moisture left in the profile after harvesting the preceding *kharif* crops. Early withdrawal of monsoon results in drying of the upper soil layers. Mulching was found beneficial to tide over the frequent moisture stress during maize growth and conserve moisture in the seed zone for *Rabi*. The research recommendation, therefore, has been: "Spread locally available mulch material such as basooti in the standing maize crop in the last week of August in light soils.' It has been found quite effective in conserving soil moisture particularly in the upper profile and enriching soil nutrients and thus increasing crop yields." Effective demonstrations of the practice were conducted in the ORP villages but this practice has not been adopted. It requires considerable labour to collect and transport the

mulching material. The labour involved is more than the expected benefits. Moreover, the availability of such materials is limited for application by all the farmers.

This practice of mulching has some scope with the small and marginal farmers and they can easily mulch a portion of their land by collecting leaf materials from the adjoining non-arable lands through their family labour. It has further given a feed back to find some alternative source of mulching material which could be easily available for large scale mulching.

6.2.6 Optimum fertilizer use

Next to water, inadequate nutrient supply is the major limiting factor for increasing crop production in the region. Optimum fertilizer use has been considered as one of the essential inputs of improved technology. Although the farmers are fully convinced about its usefulness, the occasional droughts discourage them to invest on costly fertilizers. The applied fertilizer during the years of crop failure does benefit the following crop to some extent due to residual effect.

Research investigations have clearly shown that even under rainfed conditions, fertilizer application was not only essential to get higher yields but was also remunerative. The response to fertilizer was found to vary with the available moisture for the crop. The recommended fertilizer does for different crops are given in Table 64 & results of operation research trials are presented hereunder:-

i) Maize

Majority of the farmers use only a small quantity of FYM (<5 t/ha) without any chemical fertilizer in maize. Some farmers however use 5-15 t FYM/ha before sowing and add 15-20 kg N/ha in the form of CAN in two splits 15-30 days after sowing (after first hoeing and haloding). The operational trials conducted on loamy sand soils indicated that response to optimum fertilizer use was maximum up to 40 kg N/ha where adequate FYM (10-12 t/ha) was added by the farmers. The increase in yield with FYM application was 4-8 q/ha. Nitrogen fertilizer application had only a marginal effect on yield where heavy doze of FYM was added. In the heavily FYM dressed plots, there was enhanced vegetative growth which led to premature lodging of maize crop.

Trials were conducted in soils of varying texture using heavy doses of N application. Although increases in maize yield was recorded with N doses up to 100 kg N/ha in heavy textured soils, the recommended level was 80 kg N/ha. The increase in yield due to recommended dose of N over the farmers' practice was maximum against all the input factors studied (Table 65).

Table 65: Effect of different production factors on yield of maize (q/ha)

Factor	1990	1991	1992
Fertilizer			
80 kg N/ha (Recommended)	20.9	17.69	23.3
20 kg N/ha (Farmers level)	13.3	12.5	16.5
CD (0.05)	3.2	1.3	2.3
Spacing			
30 cm	15.9	13.7	13.7
45 cm	18.3	16.5	16.5
CD (0.05)	2.1	1.3	2.7
Sowing method			
Round about	16.1	14.4	14.4
Across the slope	18.1	15.8	15.8
CD (0.05)	NS	1.8	1.4

Table 64: Recommended fertilizer doses for rainfed crops

Crop	Nitrogen (kg N/ha)	Phos-phorus (kg P_2O_5 /ha)	Potassium (Kg K_2O/ha)	Remarks
Maize	80	40	20	Medium to heavy textured soils
	40	20	10	Light textured soils
Wheat	80	40	30	Medium to heavy textured soils
	40	20	15	Light textured soils
Bajra fodder	50	-	-	
Napier bajra	75	95	-	Apply N, fifteen days after planting and repeat this fertilizer dose after each cutting. Apply P2O5 to the soil every year in two doses, the first half in spring and the second half during the monsoon
Groundnut	15	20	25	
Moong	12	40		-
Mash	12	25		-
Sesamum	35	-	-	-
Gram	15	20	-	-

Lentil	12	40	-	-
Raya	37	20	-	-
Sugarcane	150	-	-	Planted crop
	225	-	-	Ratoon crop

Note:
- *Apply N to maize in two equal splits i.e. half at sowing and remaining half a month later.*
- *Apply N to wheat in two equal splits at sowing and at 30 days after sowing (after irrigation or rain)*
- *Apply N to all pulse/oilseed crops at sowing*
- *Apply P and K (based on soil test) to all crops before sowing*

Further the effect of different sources of N fertilizer like Urea and Calcium ammonium nitrate was non significant. Nonetheless, ammonium chloride has been found to be slightly inferior to calcium ammonium nitrate and urea in improving maize yield (Table 66).

Table 66: Evaluation of N fertilizer sources in maize (grain yield, q/ha)

Year	Urea	Calcium ammonium nitrate	Ammonium chloride
1993	18.3	20.3	15.5
1994	15.1	15.8	15.4
1995	21.6	23.2	20.3
1996	27.5	28.0	25.8
1997	26.7	27.4	25.9
1998	24.7	24.6	24.7
1999	22.8	22.3	23.5
2000	21.5	21.7	20.4
Mean	**22.3**	**22.9**	**21.4**

Recently trials has been conducted on the integrated nutrient management using both organic and inorganic fertilizers in different proportions and application of nitrogen through 50% organic + 50% inorganic sources has given good results in term of yield over application of nitrogen through 100% organic as well as inorgainc sources. The integarted nutrient management also improves soil health (physical and chemical properties) in addtion to sustainable yields over the years.

ii) Fodder crops

Cultivation of fodder crops during *kharif* season is mostly done on marginal soils, where they are normally to fertilized and consequently the yields are low. Fertilizer application @ 25

and 50 kg N/ha was evaluated on sorghum and bajra. Bajra gave comparatively higher fodder yield as compared to sorghum due to its higher vegetative growth. The fodder yield increased to the extent of 180% in sorghum and 144% in bajra with application of 50 kg N/ha. The impact of fertilizer application was spectacular and farmers are now fully convinced about the optimum fertilizer use in fodder crops.

Table 67: Effect of INM on maize yield

Year	Yield (q/ha)			
	100% organic N	50% organic N + 50% inorganic N	25% organic N + 75% inorganic N	100% inorganic N
2005-06	21.11	38.05		35.11
2006-07	21.24	28.19		27.41
2008-09	42.72	39.44		41.08
2009-10		20.50	20.22	19.11
2011-12		42.59	39.26	37.93
2012-13	32.50	37.30	39.00	

iii) Wheat

Quite contrary to the popular belief, drilling of recommended dose of fertilizer has helped to increase and stabilize yield of wheat both during good and bad rainfall seasons. The fertilized crop established better initially and performed much better later due to faster root penetration, making better use of water stored in the deeper soil layers. Among the different production factors found to increase the yield of wheat, the contribution of recommended dose of fertilizer was maximum (Table 68).

Table 68: Effect of different production factors on yield of wheat (q/ha)

Factor	1990-91	1991-92
Fertilizer		
80 kg N + 20 kg P^2O^5/ha	45.2	59.2
No fertilizer	29.0	43.9
CD (0.05)	2.3	2.5

Seed treatment		
Untreated	34.9	48.5
Treated	39.2	52.6
CD (0.05)	2.3	2.5
Spacing		
22.5 cm	35.9	47.3
30.0 cm	38.3	53.8
CD (0.05)	2.3	2.5

The effect of different sources of N fertilizer was studied on farmers' fields. The response to urea and calcium ammonium nitrate was similar but the effect of ammonium chloride was relatively inferior to the former two sources (Table 69). On the medium to light textured soils, in years of water stress at wheat sowing, split application of N – half at sowing and remaining half at winter rains proved better than whole N at sowing.

Table 69: Evaluation of N fertilizer sources in wheat (grain yield, q/ha)

Year	Urea	Calcium ammonium nitrate	Ammonium chloride
1992-93	44.6	44.8	-
1993-94	31.3	30.9	27.1
1994-95	32.2	33.3	27.7
1995-96	22.1	22.6	19.1
1996-97	22.6	22.8	19.9
1997-98	25.0	25.2	22.4
1998-99	26.8	26.6	25.1
1999-2000	17.9	18.2	17.5
2000-2001	10.0	11.2	10.9
Mean	**25.8**	**26.2**	**18.9**

iv) Pulses

Biofertilizer play important role in soil health improvement and enhancing nitrogen nitrogen fixation in pulses (legumes). So, the trials on seed inoculation in chickpea and lentil were conducted and it was observed that the seed inoculated with *rhizobium* resulted in higher crop yield in comparision to un-inoculated seed.

Table 70. Performance of *Rhizobium* on yield of chickpea and lentil

Year		Yield (q/ha)			
		Inoculated		Un-inoculated	
		Seed	Stover	Seed	Stover
2004-05	Chickpea	11.20	34.60	9.83	28.80
2010-11	Lentil	6.31	-	5.48	-
2011-12	Lentil	3.96	-	3.54	-
2012-13	Chickpea	9.15	-	7.30	-

6.3 Supplemental irrigation to wheat

Trials were conducted to study the effect of supplemental irriagtion in wheat and supplemental irrigation in wheat from harvested rainwater at crown root initiation (CRI) and flowering stage increasees the grain yield by 900- 1200 kg/ha and irrigation only at crown root initiation stage increases the wheat yield by 500-800 kg/ha which varies from 20-40 per cent over rainfed wheat. The supplementaal irrigation at CRI and flowering stage results in additional benefit of Rs 15,000-22,000/ ha over the rainfed wheat.

Table 71: Performance of supplementary irrigation in wheat

Year	Yield (q/ha)					
	Rainfed		Irrigation at CRI		Irrigation at CRI + flowering	
	Grain	Straw	Grain	Straw		
2004-05	24.72	69.53	30.66	96.73	-	-
2010-11	17.14	-	21.43	-	23.33	-
2011-12	20.24	-	25.33	-	32.14	-
2012-13	19.13		24.57		29.09	

7. *Demonstrations*

Several demonstrations on different crops were conducted on the farmers' fields in the ORP villages. The effect of improved practices was demonstrated against farmers' practices. Improved practice consisted of growing of improved high-yielding variety of the crop, recommended dose of fertilizer, sowing across the slope and other practices such as seed treatment and weed control. Local practices involved farmers' management using own seed and other inputs.

The data generated over several years have consistently shown remarkable increase in the yield of different crops (Table 72). The mean increase in yield was 71.2, 88.0, 65.7, 30.9 and 64.8% in maize, moong, mash, groundnut and sesame grown during *kharif*; and 69.3, 87.4, 88.0, 65.4 and 48.8% in wheat, raya, gram, lentil and taramira grown during the *rabi* season, respectively.

Table 72: Grain yield (q/ha) of different crops by farmers' verses improved technology

Year	Crop	Farmers' practice	Improved practice	% increase
1973-74	Maize	20.8	35.3	69.7
	Wheat	10.2	18.0	76.5
1974-75	Maize	19.4	27.9	43.8
	Wheat	9.0	24.1	167.7
1975-76	Maize	17.6	30.3	72.2
	Wheat	12.2	41.5	240.1
	Raya	4.3	19.7	358.1
1976-77	Maize	18.2	27.5	51.1
	Wheat	23.0	33.0	43.5
	Raya	5.9	9.0	52.5
1977-78	Maize	11.7	27.0	130.8
	Raya	4.7	11.8	151.1
1978-79	Maize	16.2	29.2	80.2
	Wheat	13.4	42.4	216.4
	Raya	6.9	14.5	110.1
1979-80	Maize	6.9	12.8	85.5
	Raya	9.0	11.5	27.8
1980-81	Maize	25.0	37.0	48.0
	Wheat	25.1	33.2	32.2
	Raya	4.8	7.9	64.6

1981-82	Maize	10.0	27.0	170.0
	Wheat	30.6	48.5	58.5
	Raya	5.4	8.5	57.4
1982-83	Maize	4.1	9.3	126.8
	Wheat	26.2	29.3	11.8
1983-84	Maize	23.1	40.1	73.6
	Wheat	27.4	35.8	30.7
1984-85	Maize	22.9	35.4	54.6
	Raya	8.7	14.6	67.8
1985-86	Maize	11.2	22.9	104.5
	Wheat	22.3	43.0	92.8
	Raya	5.8	11.4	96.6
1986-87	Maize	13.6	25.9	90.4
	Wheat	13.5	34.5	155.6
	Raya	7.3	13.7	87.7
1987-88	Maize	Failed	10.2	-
	Wheat	19.1	20.3	6.3
	Raya	6.0	10.5	75.0
1988-89	Maize	5.6	14.7	162.5
	Wheat	13.9	35.0	151.8
	Raya	9.4	15.3	62.8
1990-91	Maize	14.7	22.9	55.8
	Wheat	21.9	32.7	49.3
	Raya	4.9	8.1	65.3
1991-92	Maize	16.5	23.6	43.0
	Wheat	29.8	35.7	19.8
	Raya	2.5	7.3	192.0
1992-93	Maize	24.9	30.0	20.5
	Wheat+raya	23.7+1.91	32.5+2.64	37.1+38.2
	Raya	4.9	8.7	77.6
	Gram	6.1	17.0	178.7
1993-94	Maize	13.5	20.1	48.9
	Wheat	16.7	28.2	68.9
	Groundnut	12.2	13.7	12.3
	Gram	6.6	10.5	59.1
1994-95	Maize	8.2	14.1	71.9
	Wheat	15.4	25.2	63.6
	Gram	6.0	9.2	53.3
	Groundnut	9.2	14.1	53.3
	Mash	2.5	5.5	120.0
1995-96	Maize	10.5	15.9	51.4

	Mash	4.4	5.6	27.3
	Groundnut	12.1	16.7	38.0
	Wheat	17.6	29.2	65.9
	Gram	4.2	12.8	204.8
1996-97	Maize	17.3	22.6	30.6
	Groundnut	9.7	12.8	32.0
	Mash	4.8	5.6	16.7
	Wheat	18.4	27.2	47.8
	Gram	9.2	14.5	57.6
	Sugarcane	407.5	552.5	123.9
1997-98	Maize	16.6	21.3	28.3
	Groundnut	11.6	13.8	19.0
	Mash	4.4	5.9	34.0
	Sesamum	4.0	5.0	25.0
	Wheat	18.8	27.7	47.3
	Gram	9.7	13.1	35.1
	Sugarcane	403.3	553.3	37.2
1998-99	Maize	11.8	15.4	30.5
	Mash	4.0	5.8	45.0
	Moong	7.1	8.7	22.5
	Sesamum	3.0	4.2	40.0
	Wheat	17.4	23.9	37.4
	Gram	6.7	10.8	61.2
	Lentil	5.0	6.2	24.0
1999-2000	Maize	13.8	18.1	31.1
	Mash	4.2	5.6	33.3
	Moong	5.6	8.0	42.9
	Wheat	12.2	16.1	32.0
	Taramira	2.4	3.4	41.7
2000-2001	Maize	19.9	28.6	43.7
	Mash	4.9	7.3	42.0
	Moong	5.1	6.3	23.5
	Sesamum	3.5	4.8	37.1
2003-2004	Maize	17.15	24.66	37.8
	Sesame	1.27	3.37	127
	Wheat	19.18	24.76	29.1
	Chickpea	2.86	454	58.7
	Taramira	2.27	3.56	56.8
	Raya	4.01	6.01	49.8
2004-05	Maize	4.56	14.42	216.2
	Green gram	2.57	5.69	121.4

	Sesame	1.10	1.92	74.5
	Wheat	20.93	31.73	51.6
	Gram	5.18	11.14	115.1
	Raya	3.52	6.35	80.4
	Taramira	1.65	2.74	66.1
2005-06	Maize	10.10	22.42	122.0
	Pearl millet	181.8	339.8	86.9
	Wheat	6.17	10.11	63.9
	Chickpea	1.43	3.33	132.9
	Raya	4.06	6.45	58.9
	Taramira	1.11	1.92	73.0
2006-07	Maize	6.98	12.54	79.7
	Green gram	1.46	3.96	171.2
	Black gram	2.02	3.90	93.1
	Wheat	24.21	32.27	33.3
	Chickpea	3.40	5.95	75.0
	Raya	1.11	1.94	74.8
	Taramira	1.56	2.51	60.9
2007-08	Wheat	25.56	40.09	56.8
	Black gram	2.45	5.67	131.4
	Wheat	15.14	21.39	41.3
	Raya	3.39	6.3	85.8
	Lentil	3.33	5.22	56.8
2008-09	Maize	30.49	39.04	28.0
	Black gram	3.05	4.35	42.6
	Wheat	16.35	26.06	59.4
	Toria	5.66	9.42	66.4
	Raya	6.87	11.02	60.4
	Taramira	5.29	6.99	32.1
2009-10	Maize	17.02	26.68	56.8
	Toria	3.98	5.64	41.7
	Raya	3.73	6.18	65.7
	Taramira	3.8	5.16	35.8
2011-12	Maize	33.17	42.42	27.9
	Black gram	3.72	6.51	75.0
	Sesame	1.87	3.75	100.5
	pearl millet	3.27	3.81	16.5
	wheat	15.48	19.64	26.9
	Chickpea	3.81	6.9	81.1
	Lentil	1.55	3.7	138.7

	Raya	4.31	6.07	40.8
	Toria	2.17	4.4	102.8
	Gobhi sarson	4.74	6.3	32.9
	Taramira	3.61	4.62	28.0
2012-13	Maize	38.30	28.66	33.6
	Black Gram	6.83	3.65	87.1
	Sesame	3.11	2.08	49.5
	Pearl Millet	365.30	299.70	21.9
	Wheat	22.67	17.29	31.1
	Chickpea	7.98	5.17	54.4
	Lentil	5.40	3.80	42.1
	Raya	7.65	5.65	35.4
	Toria	5.90	4.08	44.6
	G/ Sarson	7.12	5.80	22.8
	Taramira	4.52	3.12	44.9

8.1 Doable technologies

Groundnut as an alternative crop to maize in lower *kandi* region of Punjab

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers in lower *kandi* region grow maize in *kharif*. However, erractic rainfall, frequent dry spells and high susceptibility of maize to early and mid season droughts results in unstable and low yields, particularly when grown on sandy soils overlying loamy subsoils.

Improved Technology

Growing groundnut crop as an alternative to maize in lower *kandi* region since it requires well-drained sandy soils occurring in the region. Groundnut can be sown from mid June to first week of July with the onset of monsoon. Unlike maize, it tolerates early drought, improves soil health and acts as cover crop for soil conservation. Improved bunch type groundnut variety SG-99 variety matures in 123 days with an yield potential of 2000 kg/ha. Since pods are borne as bunch around the shoot, it allows easy harvesting with minimum pod loss. The other improved practices to be adopted for getting higher pod yield are sowing with 100 kg seed /ha after treating with Chlorpyriphos 20EC (12.5 ml/kg seed) followed by Indofil M-45 (3g/kg seed) to safeguard against termite and fungal diseases, respectively. The required spacing is 30 cm between rows and 15 cm in the row. Application of gypsum @ 125 kg/ha and drill the recommended fertilizer dose i.e. 15 kg N, 20 kg P_2O_5 as basal. Two hoeings are needed after 2-3 and 5 weeks of sowing for controlling weeds. The crop is harvested in the 4th week of October.

Maize subject to water stress

A healthy crop of Groundnut Variety SG -99 in farmer's field

Performance

Groundnut yields about 1600 kg/ha and net returns of Rs 25000 per hectare with B: C ratio of 1.75 as compared to groundnut equivalent yield of 500 kg/ha with (1500 kg/ha) with net returns of Rs 3600 per hectare and B:C ratio of 1.20. In comparison to this groundnut yields 1600 kg/ha and gives. Another added advantage is that groundnut performs better during early drought as compared to maize.

Impact and upscaling

Groundnut is cultivated by 25 per cent farmers in Operational Research Project (ORP) villages in Nawanshahr and Hoshiarpur districts of *kandi* region. Further extension efforts through FLDs, NFSM, ISOPOM and other governmental schemes can push this technology in farmers' fields along with encouraging seed village programmes through KVKs.

Improved variety of chickpea for *Kandi* region of Punjab

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers currently grow local cultivars of chickpea in *Kandi* region which are affected bydry spells and also susceptible to blight. This coupled with poor crop management resulting in low yields.

Improved Technology

Involves cultivation of superior variety and improved management practices. Variety PBG-1 is resistant to blight with a yield potential of 1600 kg per hectare and maturing in160 days. The variety is tolerant to drought. Other improved practices to be adopted are seed treatment with fungicides, sowing at 12.5 cm depth with seed drill, basal application of 13 kg N and 20 kg P205 per hectare and controlling pod borer by need based spray of Deltamathrin 2.8 EC @ 2ml/l water.

Performance

The improved technology gives higher seed yield (upto 1200 kg/ha) with B:C ratio of 2.19 . The yield advantage is 72 % as compared to local cultivar (700 kg/ha).

Chickpea - Local

Chickpea – PBG 1

Impact and upscaling

The area under PBG 1 is increasing in *kandi* region and presently covers 12 per cent in Nawanshahr and Hoshiarpur districts. Further extension efforts through FLDs, NFSM, ISOPOM and other governmental schemes can push this technology in farmers' fields along with encouraging seed village programmes through KVKs.

Maize hybrids for higher productivity under rainfed conditions in *Kandi* region of Punjab

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers grow maize (local) as major crop in *Kharif* in this region of Punjab with local cultivars, which are prone to lodging due to higher placement of cob from the ground level. They are sensitive to mid and late season droughts resulting in lower productivity and net returns.

Improved Technology

This involves replacement of local maize with hybrids namely PMH-2 and JH-3459. These hybrids are medium in height with medium cob placement from ground level, tolerant to lodging, mid and late season drought. Their average yield potential is 4125 kg/ha (PMH-2) & 4000 kg/ha (JH-3459) with attractive orange flint grains, which fetch good price in the market. These hybrids give higher yield when sown early with the onset of monsoon from 20th June to 1st July. The key management practices include optimum spacing (40-50 cm between rows and 20-25 cm between plants), seed treatment with fungicide, drilling 40 kg N and 40 kg P_2O_5/ha as basal dose and broadcasting 40 kg N/ha at knee height stage just before earthing up and weed control by spraying Atrazine @ 1.25 kg/ha in 500 litre of water as post emergent herbicide 2 days after sowing.

Local cultivar

Maize hybrid JH 3459

Performance

Maize hybrids yield 3000-3500 kg/ha under rainfed conditions, which is 80-90% higher than local (1450 kg/ha). The net returns with hybrids are upto Rs. 40,000/ha. Further, these hybrids can be harvested almost two week in advance at Physiological maturity thus leaving more residual moisture for the subsequent *rabi* crops.

Impact and Upscaling

Maize hybrids are grown by 35 per cent farmers in ORP as well as NICRA villages in Nawanshahar and Hoshiarpur district of *Kandi* region. Further extension efforts through front line demonstrations and other government schemes like ISOPOM can push this technology to more farmers.

Wheat + Raya (2:1) intercropping system for higher productivity in *kandi* region of Punjab

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers generally grow wheat and Raya as sole crop. In some areas, raya is also grown as intercrop at a spacing of 1.5 m between two rows of Raya. These practices produce lower yields of both the crops.

Improved Technology

In wheat and raya (2:1) intercropping system, wheat (PBW 175) is sown @ 100 kg seed /ha, row spacing of 25 / 30 cm from end October to 15th November after seed treatment with chloropyriphos (4 ml per kg seed) for the control of termite. It is required to drill 40 kg N and 40 kg P_2O_5/ha as basal dose and broadcast 40 kg N ha at the receipt of winter rains. Raya (RLM 619) is sown in rows, 3m apart with seed drill immediately after the completion of wheat sowing. No additional fertilizer dose is applied to raya rows.

Traditional Wheat + Raya intercropping (1:1)

Improved wheat + Raya intercropping (2:1)

Performance

Additional net return of about Rs. 1000/ha is realized due to 2:1 system of raya at 3 m as compared to sole wheat. This system also covers the risk of failure during drought due to wdie spacing and less competition for soil moisture.

Impact and Upscaling

The area under 2:1 wide row system is increasing in *kandi* region and presently covers 38 per cent wheat area in Nawanshahar and Hoshiarpur district. Further extension efforts through FLDs, NFSM, ISOPOM and other governmental schemes can push this technology in farmers' fields along with encouraging seed village programmes through KVKs.

Tractor operated seed-cum-fertilizer drill for higher productivity of wheat in *kandi* region of Punjab

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers mainly grow wheat during *rabi* in *kandi* region of Punjab. Delay in rainfall, shortage of bullock draft power, inadequate moisture in the seed zone, use of local seed drill are some of the reasons for poor yields in wheat.

Improved Technology

This involves use of tractor-operated seed cum fertilizer drill. It is developed with modified furrow openers and zero till-drill. This drill can sow 4 ha/day resulting in 75 percent of time saving. The implement places seed in moist zone without placing soil over the seed. It also places fertilizer at optimum depth. Sowing with this seed drill results in better crop stand. Wheat (PBW 175) can be sown @ 100 kg seed /ha with row spacing of 25 / 30 cm from end October to 15th November. The cost of operation is Rs.750/ha.

Performance

Wheat (Cv. PBW-175) sowing with seed drill gives 2450 kg of grain yield/ha, net returns of Rs 17648 per hectare with B:C ratio of 2.69 as compared to 1958 kg grain, Rs 11518 net returns and a B:C ratio of 2.00 with wooden plough. This translates to 25 percent increase in grain yield and Rs. 6130 additional yield.

Seed drill sown **Wooden plough sown**

Impact and Upscaling

About 20 per cent farmers in ORP village of Nawanshahar and Hoshiarpur districs currently use this seed cum ferti drill. Large scale adoption can be achieved by more demonstartion by KVKs, line departments, ATMA, promoting custum hiring system, training artisans and giving subsidy.

Taramira crop for *kandi* region of Punjab for minimizing wild animal menace

Recommendation Domain

Nawanhsahr, Hoshiarpur, Gurdaspur and Roopnagar, districts in *Kandi* region of Punjab.

Existing Practice

Farmers in the region generally grow local taramira cultivars as a guard crop around wheat or as mixed crop in pulses in upper *kandi* and also as sole/intercrop in lower *kandi* region. The yield levels of this crop is low as farmers use local varieties with poor management. Framers are aware of its value as guard crop against wild animlas but its potential is not fully exploited as a main crop.

Improved Technology

This involves growing improved varieties of taramira as a main crop to realize good income and also avoid the menace of wild animals. Since it has bitter and pungent smell, it keeps away wild animals. In view of the severe wild animal menace in *Kandi* region, growing of taramira enables farmers to take up successful *rabi* cropping. TMLC 2 is a drought tolerant variety with a yield potential of 770 kg/ha and matures in 150 days. This variety is least damaged by wild animals and can be sown in October after harvest of *kharif* crops. Other improved practices recommended are sowing either by *kera* or *pora (*under low seed zone moisture) with seed rate of 3.75 kg ha and row spacing of 30 cm, basal application of 30 kg N/ha, thinning at 21 and weeding operations 30 days after sowing and controlling *Alternaria* blight by spray of copper fungicides.

Taramira as guard crop

Taramira as main crop

Performance

Taramira cv. TMLC-gives a seed yield of 762 kg per hectare with net return of Rs 13,500 and B:C ratio of 3.39. most improtant advantage with this crop is its pungent smell , which keep away both wild and stray animal from the cultivated fields.

Impact and Upscaling

Area under taramira crop is increasing in *kandi* region due to its protective character, availability of high yielding variety and high income generating potential. About 40 per cent wheat growing farmers in ORP villages in Nawanshahar and Hoshiarpur districts of *kandi* region and about 20 per cent in the adjoining villages are already growing this crop as main crop. Further upscaling can be done through extension efforts by line departments, KVKs, besides taking up seed production. This would reduce the menace of the wild animals in the region to a great extent.

Improved variety of Pearl Millet (Fodder) for *Kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Dairy farming is main occupation of the farmers in this region. Availability of the good quality fodder is less during the lean periods due to high demand of fodder. The Farmers grow local cultivars of pearl millet (fodder) which are having low fodder productivity.

Improved Technology

Involves cultivation of high yielding variety and improved management practices. Variety FBC 16 is exclusively for fodder production. It flowers 8-10 days later than other varieties including local thus, provides green fodder for longer period. This variety has long and broad leaves which remain green till maturity and is comparatively resistant to major disease. This variety has high dry matter intake, contains low amount of oxalates with stable yield under stress conditions.

Local cultivar

Improved variety FBC-16

Performance

FBC 16 gives average yield of 35000-40000 kg/ha fodder yield which is almost double than the local cultivars even under low rainfall conditions.

Impact and Upscaling

The area under FBC 16 is increasing in *Kandi* area and presently covers about 20 % of the total area under pearl millet (fodder) in Shahid Bhagat Singh Nagar and Hoshiarpur districts. Further extension efforts through FLDs, NFSM, ATMA, RKVY and other government schemes can popularise this variety among farming community.

Establishment of vegetative barriers (Napier-Bajra hybrid) on field bunds for soil and water conservation under sloppy land conditions

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Soil erosion during the monsoon is a major problem in this region. Most of the rainfall goes waste as runoff which results in low moisture availability to the standing crop during drought period as well as low moisture for the sowing of succeeding *rabi* crops. Vegetative barrier technology can solve this problem but farmers are not so motivated to grow vegetative barriers on field bunds.

Improved Technology

The vegetative barrier of napier bajra hybrid can be raised by cuttings as well as root suckers during the month of Februray and July in this region, respectively. These vegetative barriers hold the soils of the field bunds and break the flow of water which results in percolation of the water in soil. This ultimately improves the soil moisture and reduces the soil erosion and runoff.

Vegetative barrier in farmer field

Vegetative barriers in AICRPDA experimental field

Performance

Establishment of vegetative barriers on field bunds of Napier- Bajra hybrid results in increase in grain yield of *kharif* crops (maize, sesamum & blackgram) and enhanced soil moisture for succeeding *rabi* crops besides checking soil erosion. In addition to this, it also provides fodder for the animals during the lean period as well as potential source of biomass energy.

Impact and Upscaling

Farmers in the domain area are adopting this technology as it controls soil erosion and conserves soil moisture for the succeeding *rabi* crops. Extension efforts through exposure visits to the farmer fields adopting this technology through state agriculture department and KVKs will further increase the adoption of vegetative barrier on field bunds at large scale.

Maize + greengram (2:1) intercropping system for higher productivity in *Kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Maize is predominantly cultivated as sole crop under rainfed conditions in the *Kandi* region of Punjab and the farmers in general do not cultivate any intercrop in maize in this region. Maize crop is prone to risk of mid-season and late season drought resulting in low yield. Cultivation of sole crop under such conditions is not profitable especially under severe drought conditions.

Improved Technology

The technology includes intercropping of one row of green gram in paired rows of maize (30 x 60 cm). The seed rate of maize and greengram is 20 kg/ha and 5 kg/ha, respectively and the fertilizer dose is 80:40:20 kg NPK/ha and 10 kg P_2O_5, respectively for maize and greengram.

Maize + greengram (2:1) Intercropping system

Performance

Intercropping of greengram (one row) with paired rows of maize gives higher Maize Equivalent Yield of 3153 kg/ha which is 16% higher than sole maize. The improved technology also gives additional income of Rs. 1443/ha over sole maize.

Impact and Upscaling

The technology of paired row intercropping in maize is new to the farmers of the domain region and can be upscaled through demonstrations by line departments, KVKs.

Improved rainfed variety of wheat (PBW 644) for *Kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Farmers are growing old wheat variety PBW 175 in *Kandi* region having average productivity of 3125 kg/ha.

Improved Technology

Involves cultivation of superior variety and improved management practices. Wheat variety PBW 644 is exclusively for cultivation under rainfed conditions. This variety takes about 159 days to mature; its grains are amber, bold and lustrous with less susceptibility to yellow rust and moderate resistant to brown rust.

Wheat variety PBW 644

Performance

Wheat variety PBW 644 gives average grain yield of 4100 kg/ha and is 31 per cent higher than old variety PBW 175.

Impact and Upscaling

The area under PBW 644 is increasing in *Kandi* region and presently covers 10 % of the total area under rainfed wheat in Shahid Bhagat Singh Nagar, Rupnagar and Hoshiarpur districts. Further extension efforts through FLDs, NFSM, ATMA, RKVY and other government schemes can popularise this variety among farmers.

Application of thiourea to wheat under dryland conditions

Recommendation Domain

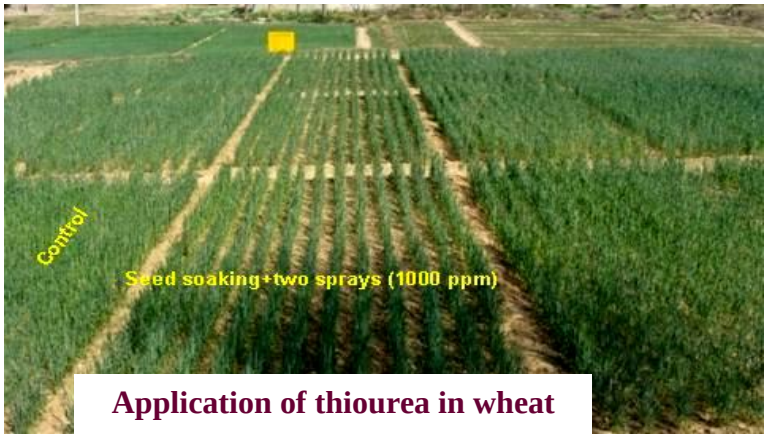
Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Availability of low soil moisture at the time of sowing of wheat crop results into poor crop stand. Since low moisture status and high temperature may kill the seedlings at the time of germination, pre-conditioning of seeds by soaking in thiourea improves the vigour. Also the terminal heat coupled with moisture stress during the reproductive stage of wheat severely affects the grain yield.

Improved Technology

Seed soaking of 100 kg seed with 150 gm thiourea dissolved in 150 litre water (1000 ppm thiourea) 12 hours before sowing and sowing with seed drill by pora method improves the germination and ultimately crop stand. Two sprays of thiourea @ 200 gm in 200 litre of water helps in mitigation of the rise in temperatures at the time of grain filling stage of wheat.



Application of thiourea in wheat

Performance

Seed soaking with 1000 ppm thiourea and two sprays with 1000 ppm thiourea (one at maximum tillering & other at booting stage) to wheat crop gives grain yield of 2166 kg/ha which is 20% higher than farmers practice.

Impact and Upscaling

The technology of thiourea application to wheat is new to the farmers of the domain region and can be upscaled through demonstrations by line departments, KVKs.

Application of phosphorus, sulphur & seed inoculation with *Rhizobium* to chickpea under dryland conditions

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

The chickpea is generally grown by the farmers on marginal soils where wheat cannot be grown. So, they only apply N as basal dose during the sowing of this crop. This is the main case of the low production and productivity of chickpea in the region.

Improved Technology

The seed inoculation of chickpea with *Rhizobium* culture is done just before sowing of the crop. The fertilizers i.e. 20 kg sulphur, 30 kg P_2O_5 and 15 Kg N per hectare is applied as basal and the inoculated seed is sown with plough by pora method at a row spacing of 30 cm.

Application of P + S in chickpea

Performance

Chickpea gives higher seed yield of 1134 kg/ha when 30 kg P_2O_5 + 20 kg S ha^{-1} ($P_{30}S_{20}$) is applied along with seed inoculation with *Rhizobium* and yields 20 – 30 per cent higher than farmers practice. This technology gives an additional income Rs. 5619/ha with B:C ratio of 2.49. Being a legume crop, chickpea responds well to sulphur and biofertilizers. Sulphur plays an important role in the formation of sulphur containing essential amino acids (cysteine, methionine and cystine), synthesis of proteins and promotion of nodulation. The application of bio-fertilizers is cheap, essential for enhancing microbial activity which improves soil health and ultimately crop yield.

Impact and Upscaling

The technology of phosphorus, suphur and bio-fertilizer application to chickpea is new to the farmers of the domain region and can be upscaled through demonstrations by line departments, KVKs.

Sesame (*Sesamum indicum* L.) a profitable alternate crop under delayed monsoon in *kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

The normal onset of south – west monsoon rains in *kandi* region is last week of June. Maize is the predominant *kharif* crop in the region. The farmers cultivate maize even under delayed monsoon conditions i.e. even after 15th July, resulting in poor performance of maize crop, reduction in yield and less income.

Improved Technology

Sesame (*Sesamum indicum* L.) is an alternate crop for maize under delayed onset of south – west monsoon. Sesame is drought tolerant crop and water requirement of this crop is low compared to maize. The seed rate of sesame is 2.5 kg/ha and var. RT 346 is sown with seed drill by pora method at 3-4 cm deep or by broadcasting followed by light planking. N id applied as basal @ 35 kg/ha.

Performance

Sesame var. RT 346 gives average yield of 450 kg/ha with net return of Rs. 34,000 due to higher market price. Another advantage is that sesame crop sown under late conditions i.e. in the third week of July is also less affected by phyllody.

Sesame under timely sown condition

Sesame under late sown condition

Impact and Upscaling

The area under sesame is less than 1 per cent in region, the farmers are now shifting from maize/rice due to less cost of cultivation and less incidence of phyllody in the late sown conditions. The extension efforts through FLDs by state agriculture department as well as KVKs, can promote the cultivation of this crop to benefit the farming community.

Sesame (*Sesamum indicum* L.) as alternate crop during *kharif* season in wild/stray cattle menace prone areas

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Maize is predominant *kharif* crop in the *kandi* region of Punjab but wild/stray cattle menace is becoming a major threat to maize in this region.

Improved Technology

Sesame (*Sesamum indicum* L.) is an alternate crop for maize in the region where crop is damaged by cattle. In *Kharif* season, sesame is least damaged by wild animals and can be grown in this area.

Performance

Sesame is drought tolerant crop and is less damaged by the wild/stray animals compared to maize. The seed rate of sesame is 2.5 kg/ha and var. RT 346 is sown with seed drill by pora method at 3-4 cm deep or by broadcasting followed by light planking. Nitrogen is applied as basal dose @ 35 kg/ha.

Maize crop damaged by stray animals

Sesame crop under similar situation

Impact and Upscaling

The area under sesame is less than 1 per cent in region, the farmers are now shifting from maize/rice due to low cost of cultivation and higher returns besides less damage by wild/stray cattle.. The extension efforts through FLDs by state agriculture department as well as KVKs, can promote the cultivation of this crop to benefit the farming community.

Toria + Gobhi sarson (1:1) intercropping system for better returns in *kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Pathankot, Sahibzada Ajit Singh Nagar and Rupnagar districts in Punjab.

Existing Practice

Farmers mainly grow wheat during *rabi* in *kandi* region of Punjab. After harvesting maize in last week of September, residual soil moisture continues to reduce till the sowing of wheat in the last week of October. Sowing wheat on deficit seed zone moistures (upper soil layer dries up due to early withdrawal of monsoon) leads to poor crop stand and low production.

Improved Technology

The improved technology involves the soiwng of gobhi sarson and toria (1:1) intercropping immediately after harvest of maize crop in the last week of September to utilize the residual soil moisture efficiently. The gobhi sarson variety (GSC-7) and toria variety (TL -17) is sown simultaneously in alternate rows 22.5 cm apart with seed rate of 2.5 kg/ha per crop by pora method. Other management practices involves the basal application of 40 kg N and 20 kg P_2O_5/ha, thinning after 3 weeks of sowing. The benefit of this system is that growth of toria occurs in the month of November, whereas gobhi sarson remains dormant till end December and toria crop is harvested in the month of December. The already established but dormant gobhi saron resumes its growth in the second fortnight of January. The gobhi sarson is harvested in end march, thus there is lesser competition for growth and soil moisture in these two crops.

Performance

Intercropping of toria + gobhi sarson (1:1) gives seed yield of 480 kg/ha of torai and 1100 kg/ha yield of gobhi sarson with additional income of Rs 7800/ha as compared to sole gobhi sarson and Rs. 5210/ha over sole wheat cultivation. The main advantage of this system is that both the crops require less soil moisture for growth in comparison to wheat and intercropping of toria + gobhi sarson, is profitable even in drought years.

Sole toria

Toria and Gobhi sarson intercropping

Impact and Upscaling

The area under toria+gobhi sarson (1:1) intercropping system is 15-20 per cent in adopted villages villages of SBS Nagar and Hoshiarpur districts of *Kandi* region. Further extension efforts through FLDs by KVKs and other government schemes can popularise this system among farmers.

Integrated nitrogen management practices in maize/blackgram-wheat/lentil cropping system under dryland conditions

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Gurdaspur, Sahibzada Ajit Singh Nagar and Roopnagar districts in *Kandi* region of Punjab.

Existing Practice

The Farmers of the region are using mostly FYM to raise the crops and very less inorganic fertilizers i.e. they do not integrate the organic and inorganic sources of nitrogen. During *rabi* season farmers hardly apply organic sources of nitrogen.

Improved Technology

The improved technology involves the integrated nitrogen management i.e. combination of organic (compost or green leaves of subabul) and inorganic (urea) sources of nitrogen in different proportions. For maize/blackgram-wheat/lentil cropping system 15 kg N/ha through compost/green leaves (organic) + 20 kg N/ha through urea (inorganic) help in sustaining the productivity level and improves soil health. The organic sources of nitrogen are applied before sowing while the half of inorganic nitrogen is applied at the time of sowing and remaining half at knee height stage in maize and after receiving winter rains in wheat.

Maize/blackgram **Wheat/lentil**

Performance

The integrated application of nitrogen performs better compared to sole application of organic or inorganic sources. The 15 kg N/ha (compost/green leaves) + 20 kg N/ha (urea) treatment in maize/blackgram and wheat/lentil gives higher crop yield and net returns as compared to application of either organic or inorganic source of nitrogen.

Impact and Upscaling

The farmers of the region are integrating organic or inorganic sources of N fertilizers to some extent but the proper integration of these sources can be upscaled through trainings/demonstrations by line departments, KVKs to the farmers of the *kandi* region.

Wheel Hand Hoe for efficient weeding for rainfed crops in *kandi* region of Punjab

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Gurdaspur, Sahibzada Ajit Singh Nagar and Roopnagar districts in *Kandi* region of Punjab.

Existing Practice

Farmers do weeding manually and use khurpi/sickle in different crops. This method of weeding is time consuming and uneconomical which results in poor crop yield.

Improved Technology

The improved technology involves the use of wheel hand hoe for the weeding operations in different crops. The weeding is generally done 30 to 35 days after sowing. It takes 3 mandays/ha for weeding with wheel hoe in comparison to 25 -30 days with manual weeding and it also provides soil mulch which reduces moisture losses. Moreover availability of labour is a problem in Punjab in this region.

Wheel Hand hoe

Performance

The use of wheel hand hoe increased the crop yield of *kharif* and *rabi* crops by 5-10 per cent over traditional method of weeding. The weeding with wheel hoe reduced the required mandays drastically about 20 which resulted in saving of Rs. 5000/ha as the labour is costly in Punjab (Rs. 250/manday).

Impact and Upscaling

This technology has spread to about 20 per cent of the farmers in *kandi* region of Punjab. With further extension efforts and promotion of this implement by the line departments and KVKs can further upscale and popularize the implement among the farming community.

Contingency crop planning for *kandi* region of Punjab on light textured soils

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Gurdaspur, Sahibzada Ajit Singh Nagar and Roopnagar districts in *Kandi* region of Punjab.

Existing Practice

The farmers of the region are growing maize and wheat irrespective of time of onset, withdrawal and extent of south west monsoon rains. The rains are main source of water/moisture for the crops of both the seasons and water requirement of both the crops is higher than some oilseeds and pulses. This is the main reason for low productivity in this region.

Improved Technology

The improved technology involves the sowing of the different crops with the onset of south west monsoon rains. For timely onset of monsoon the preference of *Kharif* crops should be blackgram, pearlmillet (grain), maize, pearlmillet (fodder), sesamum and greengram. If sesamum crop is to be grown, it can be sown after 15th July. For late sowing the preference of *kharif* crops should be pearlmillet (grain), blackgram, maize (fodder), pearlmillet (fodder), greengram and sesamum. For timely sowing of *rabi* crops under low moisture conditions due to early withdrawl of monsoon and no winter rains, taramira crop should be preferred. For late sowing of *rabi* crops under low moisture conditions crops like taramira, lentil and raya are to be preferred compared to wheat, barley and triticale.

***Kharif* season** ***Rabi* season**

Performance

The blackgram, sesame and pearlmillet (fodder) crop in *kharif* season, in case of late onset of moonson, while taramira and lentil in *rabi* season (low soil moisture conditions) should be grown as the water requirement of these crops is low. Moreover they perform better than maize and wheat under such conditions.

Impact and Upscaling

The technology of cultivation of the crops according to onset and extent of south west monsoons is new to the farmers of the domain region and can be upscaled through trainings/demonstrations by line departments, KVKs.

Reduced tillage for maize-wheat cropping system under rainfed conditions

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Gurdaspur, Sahibzada Ajit Singh Nagar and Roopnagar districts in *Kandi* region of Punjab.

Existing Practice

Farmers are cultivating their fields 4-5 times before the sowing of the crop. This practice is increasing their cost of cultivation and also leads to wastage of resources and manpower.

Improved Technology

The improved technology involves one summer ploughing after the harvesting of *rabi* crops and receiving sufficient rains, then the fields are prepared by one ploughing + planking for sowing of *kharif* crops. For *rabi* season, immediately after harvesting of *kharif* crops the fields are ploughed once (in evening) followed by planking (in next morning) to conserve the soil moisture. Depending upon the sowing time of *rabi* crops, the field are prepared by one ploughing, planking followed by sowing with seed drill.

Maize

Wheat

Performance

Reduced tillage gave the grain yield which is at par with conventional tillage (farmer's practice). It reduced the cost of cultivation by Rs. 3000/ha only by reducing the number of ploughings required to prepare the fields for sowing of the crops.

Impact and Upscaling

The technology of reduced tillage/cultivation of the crops is new to the farmers of the domain region and can be upscaled through trainings/demonstrations by line departments, KVKs.

Higher wheat productivity in *kandi* region through supplemental irrigation with harvested rainwater

Recommendation Domain

Shahid Bhagat Singh Nagar, Hoshiarpur, Gurdaspur, Sahibzada Ajit Singh Nagar and Roopnagar districts in *Kandi* region of Punjab.

Existing Practice

About 40-50 per cent rainfall goes as runoff during *kharif* season and not stored properly. Hence, the wheat crop grown during *rabi* season is completely rain dependent which results in low productivity due to moisture deficit in the low rainfall seasons.

Improved Technology

In *kandi* region of Punjab out of annual rainfall of 1081 mm, 80 per cent is received during the *kharif* season. The majority of the rains are received in three to four events. This runoff water was harvested in the village pond and used for post sowing irrigation in wheat crop at crown root initiation stage (CRI) and flowering stage for better productivity and net returns.

Performance

The supplemental irrigation in wheat from harvested rainwater at crown root initiation (CRI) and flowering stage increasees the grain yield by 900- 1200 kg/ha and irrigation only at crown root initiation stage increases the wheat yield by 500-800 kg/ha which varies from 20-40 per cent over rainfed wheat. The supplementaal irrigation at CRI and flowering stage results in additional benefit of Rs 15,000-22,000/ ha over the rainfed wheat.

Rainfed wheat

Irrigation at CRI stage

Irrigation at CRI & floweing stage

Impact and upscaling

The adoption of this technology will increase the wheat yield in rainfed areas and reduce the risk of crop failure under adverse weather conditions. The technology is widely accepted by the farmers and can be further upscaled through trainings/demonstrations by line departments, KVKs. .

8.2 Technologies which are included in package of practices of SAU

On the basis of research findings and from operational research trials, suitable recommendations for rainfed cropping in *Kandi* area of Punjab have been developed. These recommendations have formed part of the package of practices for *Kharif* and *Rabi* crops brought out by the Punjab Agricultural University, Ludhiana. It is possible to increase yield of rainfed crops by 50-100% by adopting these practices.

8.2.1 Moisture conservation practices

i. Level the land and raise bunds all around the fields and provide outlets for safe disposal of excess rainwater before the onset of monsoon.
ii. Plough the fields before the onset of monsoon to open the soil and enhance its water intake.
iii. Plough the fallow fields occasionally during *kharif* to keep them weed free or grow a green manure crop of sunhemp.
iv. Spread locally available organic mulch material, in the standing maize crop in the last week of August in light soils. It helps in conservation of moisture in the surface layers and helps to secure optimum stand of *rabi* crops. It also helps maize crop in case of drought.
v. Start preparatory tillage soon after the harvest of *kharif* crops.
vi. Supplemental irrigation at crown root initiation stage i.e. 30-40 days after sowing for higher productivity of wheat.

8.2.2 Selection of suitable crops and varieties

i. Two crops a year viz. maize-wheat/wheat+gram/wheat+raya perform better on medium and high moisture storage soils.
ii. Grow a green manure crop of sunhemp in the light textured soils which are generally kept fallow during the *kharif*. Incorporate this crop in the middle of August and raise wheat during *rabi*.

8.2.3 Seed rate and spacing

i. Sow maize in rows 35-40 cm apart with plants spaced at 30 cm apart.
ii. Use higher seed rate of wheat (100 kg/ha) to cover the risk of poor germination and attack of white ants and termites.

8.2.4 Time and method of sowing

i. Sow maize with first monsoon showers and across slope on sloping lands.
ii. Sow wheat from last week of October to last week of November.
iii. Sow wheat seed relatively deeper (8-10cm) and in wider row spacing (30 cm).
iv. Sow the sesame crop after 15th July to minimize the attack of phyllody.
v. Sow taramira/brassicas in the 2nd fortnight of October to avoid alternaria blight.
vi. Sow raya seed at 7-8 cm depth in soil as compared to 4-5 cm seeding depth.

8.2.5 Weed control and interculture

i. Apply Atrazine @ 1 kg/ha on medium to heavy textured soils as pre-emergence spray in maize. The dose of herbicide can be reduced by 40% in light soils.
ii. Give one manual hoeing 15-20 days after sowing of maize, followed by haloding with desi plough 30 days after sowing.
iii. Give two hoeings to wheat to check weed growth and reduce evaporation from the soil.

8.2.6 Termite control

Treat wheat seed with Aldrin 30 EC or chloropyriphos 20 EC @ 4 ml/kg seed to controls termite infestation.

8.2.7 Fertilizer use

i. Apply 8-10 t FYM/ha before sowing maize to get maximum benefit from fertilizer use.
ii. In maize and wheat, apply half of N and whole of P and K by drilling at sowing and broadcast remaining N one month later depending on rain.
iii. In *rabi* crops, fertilizer must be drilled at or before sowing so as to place it in the moist zone.

8.2.8 Water harvesting and recycling

Collect runoff water during monsoon in individual or community tanks/ponds and give one supplemental irrigation to *rabi* crops at pre-sowing or post-sowing (30-40 days after sowing). In case of drought during *kharif*, life saving irrigation can be given to the *kharif* crops.

8.3 Technologies which have gone for upscaling by district/ state and or also converged with national/state programs/ schemes like MGNREGA, RKVY, NFSM, NHM, DDP, DPAP, Watershed programs, Farm machinery etc.

8.3.1 Convergence opportunities for up scaling through national /state level schemes

- Since 1983 about 410 breeding trials of different crops at Ballowal Saunkhri have been conducted under rainfed conditions, these include about 250 maize trials on new composites and hybrids having top crosses involving new promising inbred lines, 20 trials on half-sib families under the population improvement programme, 15 trials on indigenous germplasm besides 22 advance and 50 co-ordinated trials on elite germplasm. The materials evaluated in these experiments include 4540 new experimental hybrids and composites, 691 top crosses, 1405 half-sib families and 504 full-sib families for maize while 250 progenies of Barley pool -1, 292 progenies of Barley pool-2 and 403 collections from Punjab, Himachal Pradesh and Uttar Pradesh.
- All India and zonal coordinated varietal trails on maize (on an average three trials per year) and station trails (8 to 10 trials per year) on early maturing and high yielding materials are regularly conducted to identify the genotype suitable for *Kandi* area.
- Coordinating with state departments, district administration, SAU, ATMA, KVKs, RKVY, NHM, MGNREGA etc for upscaling technologies.

Item	Technology	Utilization
Scientific advancement (equipment, methodologies, processes, etc.)	Summer ploughing	Maximize *in-situ* rain water & minimize runoff
	Compartmentalization & field bunding	To harvest maximum rain water & minimize runoff
	Laser leveler	For maximum in-situ moisture conservation
	Vegetative Barrier	To minimize the runoff and soil losses and increase *in-situ* moisture conservation
	Mulching	To reduce evaporation losses, splash erosion and increase *in-situ* moisture conservation
	Haloding (earthing up)	To harvest *in-situ* rain water and weed control
	Modified furrow opener and zero till drill	Sowing under less moisture to ensure emergence
	Drip & sprinkler irrigation	To increase water productivity
Policy issues	Water use policy	Restriction on use of tubewell for high water

(Local/State/ Central)		requirement crops. Incentive for saving of water when used judiciously by using micro irrigation.
Planning & Development	Development of crop calendar and contingency crop plan	Helps in combating with aberrant weather conditions.
Technology dissemination	INM (15 kg N/ha (compost/ green leaves) + 20 kg N/ha (Urea)	To sustain productivity and restoring soil health
	Maize hybrids (PMH 2; Blackgram (Mash 114); Greengram (ML-818 & PAU 911	For high yield and drought tolerance than local varieties
	Lemon Grass	Medicinal value and effective in soil conservation on undulating land
	Wheat variety PBW 644 & PBW 660	For high yield and drought tolerance than local varieties
	Wheat seed treatment with chloropyriphos	To control termite attack and maintain optimum plant population
	Raya varieties RLM-619 & PBR 97	For high yield and drought tolerance than local varieties
	Wheat + Raya intercropping	To cover the risk of crop failure
	Chick pea variety PBG-1 & PBG 5	For high yield, drought tolerance & resistance to blight than local varieties and to promote crop diversification
	Taramira variety TMLC-2	For high yield and drought tolerance than local varieties and crop cover against animal damage
	Pendimethalin in blackgram	For effective weed control
Rural Livelihoods	Water Harvesting Structures	To harvest rainwater for use during drought period or when needed
	Reduced tillage + chemical weed control	To reduce the operation cost
	Agro-horticulture & Agro-forestry	To ensure returns under drought conditions
Women empowerment	Skill development in IGA's	To generate additional income and empower women
Drudgery reduction	Improved hand implements	To save human energy and more output.

8.4 Contingency crop plans

Rainfed agriculture occupies 60% of total net sown area in India and contributes 40% of the total food production. The crop production in rainfed areas has inherent risks because of its dependence on rain. Farmers in such areas face several uncertainties like aberrant weather, uncertain crop productivity and profitability. In this context, All India Coordinated Research Project for Dryland Agriculture (ICAR) under the aegis of Central Research Institute for Dryland Agriculture (CRIDA) is conducting location-specific and need based research programs in arid, semiarid and sub-humid agro-ecologies through 25 network centers located across the country. AICRPDA centre – Ballowal Saunkhri is one of them and is working on the development and refinement of crop varieties and agriculture technologies for the rainfed areas of the Punjab state.

The main source of water for crops in rainfed areas is rain, 80% of which is received during the south-west monsoon period i.e. between July - September. Normally, there are at least four important aberrations in the rainfall behavior, viz., i) early commencement of the rains, or considerably delayed monsoon, ii) intermittent “breaks” during the cropping season, iii) variation in spatial and/or temporal aberrations, and iv) early cessation of rainfall.

These situations call for attention of agricultural scientists and planners to develop crop contingent measures to save the rainfed crops from varied monsoon aberrations. Further, there is a need to select crops and varieties matching the effective growing seasons. The high variability of rainfall (more precisely, the soil-water) is the single factor which influences the high fluctuations in crop yields.

Keeping this in view, the contingency crop plans for all the crops sown under rainfed conditions in Punjab have been prepared and are given in annexure - 3. AICRPDA centre has implemented/adopted real time crop contingency at the NICRA villages in recent years during the drought period or attack of some insect-pest/diseases and some of crop contingency implemented are discussed here as under:

8.4.1 Real time crop contingency

8.4.1.1 Mid-season drought (at the time of grain filling)

In case of midterm drought during the project period following steps were under taken to minimize the effect of dry spell on crop through demonstrations on farmers’ fields:

- Weak plants were removed from the field (around 15-20 %) and used as green fodder for the animals.
- Hoeing of maize fields was done to break the capillary action to reduce the evaporation losses.
- Supplementary / lifesaving irrigation was given depending upon water availability.

8.4.1.2 Crop lodging

Heavy rains and wind stroms leads to severe crop loadging in maize and at the time of grain filling stage. Farmers were advised to cut the lodged crop and go for vertical staking in the field. Vertical lodging of the crop will reduce the rotting of crop and rodents problems. In normal practice the farmers of the area, removes the cobs of the lodged crop, which results in shrivelled grain while vertical staking results in proper grain filling due to residual sap in the maize stalk preserving fodder quality.

Late sown maize crop by some of the farmers at tasseling /milking stage also faced lodging problem. The farmers were advised to cut the crop, which was at tasseling stage and use it as green fodder for the animals, while for the crop at milking stage were advised to sell the green cobs in these market for consumption as roasted cobs.

Maize crop affected by storm

Bundle formation of maize crop

Vertical staking of maize crop

8.4.1.3 Early withdrawal of monsoon

The early withdrawal of monsoon and less rainfall/no rains in the month of October and November resulted in low moisture in the soils. To overcome this problem following real time crop contingency was adopted in NICRA villages:

i) Pre-sowing irrigation

In light textured soils, where soil moisture was less, rain water harvested in the renovated dugout pond (approx. 2000 cum. stored water) at NICRA village Nainwan was used for pre-sowing irrigation to about 10 ha of land which resulted in the sowing of different crops in these fields which otherwise would have been left unsown.

Irrigation with MIS System

ii) Drill sowing in wheat

On the farmers' fields with medium textured soils, the sowing was done with seed drill and furrows were kept open, this practise resulted in uniform and good germination of the crops like wheat, raya, pulses in comparison to sowing done with broadcasting method.

Drill sowing of wheat

8.4.1.4 Supplemental irrigation in wheat

The farmers of project area were also advised for application of life saving / supplementary irrigation at crown root initiation (CRI) stage in wheat depending on the availability of irrigation water, which resulted in increased the grain yield (15-20 %) over wheat without life saving irrigation.

Irrigation at CRI

Wheat without lifesaving irrigation

8.4.1.5 Severe attack of hairy caterpillar on mash and sesame

The severe attack of hairy caterpillar on mash and sesame was observed. Even after the spray of recommended insecticides, there was repeated incidence of the same after an interval of 8-10 days. It was observed that the pest was surviving on the alternate host like bushes and shrubs nearby the crop fields. The farmers are advised to spray the recommended insecticides on the crop as well as on the bushes and shrubs near to crop fields that controlled the pest.

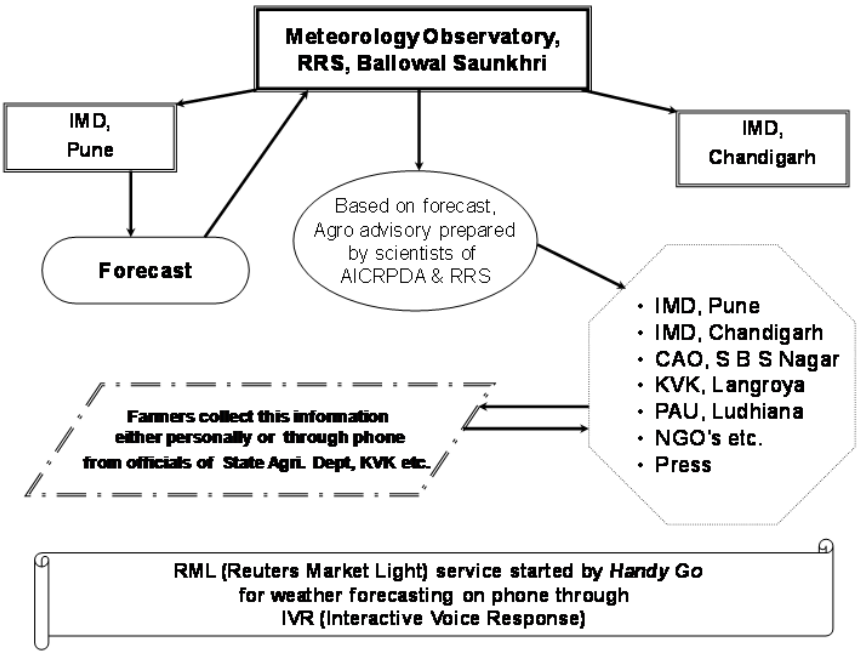
8.5 Technologies in pipeline

- Reduced tillage with integrated nutrient management for maize-wheat cropping system under rainfed conditions
- Contingency crop planning for seasonal drought under late sown conditions in light textured soils
- Blackgram-raya/chickpea cropping sequence for higher productivity, profitability and sustainability under rainfed conditions.
- Vegetative barriers for soil and water conservation on fields under sloppy land conditions.
- Napier Bajra hybrid on field bunds for fodder and soil conservation.
- Lemongrass as alternate crop for marginal lands.
- Laser leveling with flat configuration in conserving moisture at the end of season due to decreased runoff losses.
- In light textured soils intercropping of one row of greengram in between paired rows of maize (30/60 cm) for better maize equivalent yield.

- The soaking of wheat seed in 1000 ppm thiourea + two sprays of thiourea (one at maximum tillering & second at booting stage) for increased grain yield and mitigation of terminal heat stress.
- In chickpea, application of P + S (30 kg P_2O_5 + 20 kg S/ha) and seed inoculation with *Rhizobium*/phosphate solubilizing bacteria (PSB) for higher yield, root nodulation and returns.
- Seed priming of chickpea with 500 ppm of molybdenum for higher yield and returns.

8.6 Contribution to Science, Policy, Agro advisories etc.

The AICRPDA as well as Research Station scientists provide expertise/advise/technical know how about different rainfed agricultural technologies e.g. duirng aberrant weather conditions, sowing of different crops/varieties in *kharif* and *rabi* season as per contingency crop planning, in case of monsoon delayed beyond 15th July, farmers advised to go for sowing of pearlmillet, sorghum, greengram, blackgram and sesame instead of maize whereas, in case of early withdrawal of monsoon that leaves low soil profile moisture for sowing of *rabi* crops, the farmers advised to sow low mositure requiring crops like oilseeds with seed drill to place the seed in low seed moisture zone and keep the furrows open particularly in light soils. The centre is also providing bi-weekly Agro-Advisories to the farmers of the region regarding the different farming operations, control of insect-pest etc.



Agro-Advisory Services

The Chief scientist, AICRPDA, Ballowal Saunkhri cum- Director of station is also involved by the district authorities/university authorities, while framing the policies for the region. The local issues/probelms related to crop and tree component raised by the farmers/district authorities/NGO's are addressed and solved by visiting the fields by team of scientists and providing site specific solution to the user. The new emerging issues those can not be solved at station level are discussed in the monthly review meeting of research & extension with Director of Extension Education and Director of Research, PAU, Ludhiana and feedback is given to the concerned Department for further research and possible solution e.g. attack of blister beetle –menace to *kharif* crops particularly in greengram.

8.7 Role of AICRPDA scientists in activities like Seed production, custom hiring, fodder production or any other resource generation

AICRPDA scientists are involved in various resource generation activities as under:

- Seed production of recommended varieties of different crops
- Nursery production of fruit/forest plants
- Nursery of recommended variety of Napier-Bajra hybrid and lemon grass etc.

9. Linkages

- Linkage at national and international level (Ohio State University of USA in watershed management, CDM project with European Union, Swaminathan Trust, Department of Science & Technology (New Delhi), World Bank for Integrated Watershed Management & JBIC for imparting trainings in Joint Forest Management).
- Linkages at State level:

S.No.	Organizational Linkage	Purpose
1	Departments of Punjab Agricultural University, Ludhiana	Technical guidance for planning, execution of experiments and reviewing of on-going research.
2	KVKs (PAU, Ludhiana) of domain area	Up scaling of technologies, skill development for IGA's and developing technology park for transfer of rainfed agriculture technologies
3	Punjab State Forest Department	Strengthening afforestation, transfer of technologies through collaborative research and training projects.
4	Punjab State Department of Agriculture, Horticulture & Soil Conservation	Transfer of new technologies through demonstrations, kisan melas and field days.
5	Punjab State Department of Education	Interaction with teachers, students, eco clubs for awareness regarding environment, biodiversity conservation & natural resource management.
6	Punjab Energy Development Authority	Establishment of linkage between department and farming community for energy conservation promoting solar energy and biogas.
7	India Meteorological Department	Agro-advisory is submitted biweekly to CAO, SBS Nagar, KVKs, PAU, NGOs, progressive farmers and Press.
8	District Administration	Interaction with authority regarding rainfed agriculture technologies and for dissemination among farming community through line departments.

9	NGOs	Transfer of technologies, formation of SHGs and support and value addition
10	The Unati Co-op. Marketing-cum-Processing Society Ltd., Talwara, Distt. Hoshiarpur	Marketing support to farming community of fruits grown in *kandi* area, value addition and employment generation.

10. Capacity building

- Dissemination of technology through Kisan Goshti, Kisan Mela organized twice a year, field days, agriculture production committee meeting with district administration and personal contacts with farmers.
- The AICRPDA, main centre, Ballowal Saunkhri is playing a key role in the capacity building of field functionaries of the state departments in the key areas of watershed management, water resource development and its efficient use, joint forest management, agro-forestry for hill and plain area, soil & water conservation and medicinal & aromatic plants.
- About 1600 field functionaries from different departments of different states have been upskilled in the field of Agriculture (crop production), Horticulture, Forestry, Soil and Water Conservation and Animal Husbandry under the Integrated Watershed Development Project (IWDP) funded by World Bank as well as JBIC funded project for capacity building of field staff of Punjab state forest department in different key areas of watershed development where AICRPDA scientists provided expertise as resource person.
- Training to farmers regarding bee keeping, processing & value addition
- Formation of self help groups and technical support to co-operative societies
- Field visits, awareness camps about importance of water conservation, impacts of climate changes, etc.

11. Publications

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12. Awards/ Recognition

- **Awards**
  - ✓ Chaudhary Devi Lal Outstanding (ICAR – AICRP) Award 2009 to AICRPDA for outstanding contribution in the field of Dryland Agriculture (AICRPDA– Centre Ballowal Saunkhri among 25 centres & 8 ORP's).
  - ✓ Dr S C Sharma, Chief Scientist, AICRPDA – Ballowal Saunkhri got Brandis Award – 2005 in recognition of silviculture research.

- **Special commendations by any national/international agencies etc.**

  - ✓ AICRPDA team got funding for projects from European Union & DST, GOI, New Delhi in the field of carbon sequestation and natural resource managemnt because of technical strenghts.

13. How the centre emerged as focal point/ visibility in droughts and addressing local issues

AICRPDA centre plays the key role in mitigating the effects of droughts if any in the domain area. Regular agro advisories are given to farmers to make them aware about the weather aberrations and the needed measures to manage the situations. Local administration and state departments are also involved for faster and widespread dissemination of the information. AICRPDA centre acts as a coordinating link between farmers, state agencies and farmer commision.

14. Visioning and strategies

14.1 Vision

To promote rainwater harvesting and its judicious utilization for sustainable crop production, evaluate and promote crops/varieties suitable for abberant weather conditions, crop diversification through tree farming, oilseeds, pulses and vegetables, ensure timely availability of quality seed/planting material, develop linkages for marketing of end products and provide technical know-how to farmers about value addition and subsidary occupations.

14.2 Research Strategies

- Rainwater harvesting and its efficient use
- Development of cost-effective gully control measures
- Estimation of water & nutrient balance for a micro-watershed in a farming system
- Precision leveling for reducing runoff & soil loss and providing safe drainage
- Adaptation to Climate Change through crop contingency, diversification and natural resource conservation
- Evaluation of new varieties of rainfed crops
- Assessment of carbon sequestration in different land use systems
- Economic evaluation of different Farming Systems for self sustainability
- Feasibility of subsidiary occupations like pisci-culture, apiculture
- Capacity building of field functionaries and farmers

Annexures 1

Theme-wise experiments conducted since inception

S. No.	Experiment
	1971-72
	Rainwater Management
1	Moisture use efficiency of different crops
2	Effect of mulch on moisture conservation and yield of wheat and barley
3	Field water harvesting for rainfed farming for bajra-gram rotation
4	Water intake studies
	Crops and cropping sequence
5	Effect of row geometry on yield of bajra
	Integrated Nutrient Management
6	Fertilizer use for dryland maize
	Others
7	Studies on soil compaction
	1972-73
	Rainwater Management
1	Moisture use efficiency of different crops
2	Mulch experiment
3	Effect of supplemental irrigation at different moisture stress of wheat crop
	Crops and cropping sequence
4	Crop sequence experiment
5	Maximization trial on maize and wheat
	Integrated Nutrient Management
6	Fertilizer use for dryland maize and wheat
7	Residual effect of P application on wheat
8	Response of N & P application to local wheat under rainfed conditions
	Others
9	Studies on soil compaction
	1973-74
	Rainwater Management
1	Moisture use efficiency of different crops
2	Mulch experiment
3	Water intake studies
	Crops and cropping sequence
4	Crop sequence experiment
	Integrated Nutrient Management

5	Fertilizer use for dryland maize and wheat
6	Fertilizer use for dryland oilseed crops
7	Response of P application to maize
	Contingency crop planning
8	Selection of suitable fodder in soils of low fertility
	Evaluation of varieties
9	Performance of different varieties of wheat under rainfed conditions
10	Performance of different varieties of rape and mustard
11	Performance of different varieties of barley
12	Performance of different varieties of groundnut
	1974-75
	Rainwater Management
1	Mulch experiment
2	Runoff collection experiment
3	Water intake studies
4	Inter row water harvesting experiment
5	Moisture use efficiency of different crops
6	Studies on supplemental irrigation
	Crops and cropping sequence
7	Maximization trial on wheat
8	Studies on seeding method
9	Crop sequence experiment
	Evaluation of varieties
10	Varietal trial maize
	Integrated Nutrient Management
11	Fertilizer use for dryland maize and wheat
	Rainwater Management
1	Moisture use efficiency of different crops
2	Mulch experiment
3	Water intake studies
4	Compaction and mulching experiment of sugarcane
	Crops and cropping sequence
5	Crop sequence experiment
6	Fertilizer use for dryland maize
7	To find out suitable cultural practices for maximizing the yield of local maize
8	Geometry of crops
9	Studies on physiological harvesting of maize
10	Maximization trial on wheat and raya

	Integrated Nutrient Management
11	Studies on use of Azotobacter culture in dryland wheat
12	Manurial requirement of maize – wheat rotation using FYM
13	Studies on fertilizer mixing with seed in wheat
	Evaluation of varieties
14	Screening of varieties of wheat for rainfed areas
	1976-77
	Rainwater Management
1	Mulch experiment
2	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
3	Crop sequence experiment
4	Maximization trial on maize, wheat and raya
5	Studies on physiological harvesting of maize
6	Effect of cultural practices on maize and wheat yield
	Integrated Nutrient Management
7	Manurial requirement of maize – wheat rotation using FYM
8	Fertilizer use on dryland crops
9	Studies on fertilizer mixing with seed in wheat
	Evaluation of varieties
10	Screening of varieties of wheat for rainfed areas
	77-78
	Rainwater Management
1	Mulch experiment
2	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
3	Maximization trial on maize, fodder, wheat and raya
4	Intercropping od arhar in maize and sorghum
5	To study the optimum time and method for N application in maize
	Integrated Nutrient Management
6	Manurial requirement of maize – wheat rotation using FYM
7	Fertilizer use on dryland crops
8	Studies on fertilizer mixing with seed in wheat
	Evaluation of varieties
9	Screening of varieties of wheat for rainfed areas
	1978-79
	Rainwater Management

1	Effect of mulching on moisture conservation and yield of maize – wheat rotation
2	Increasing crop intensities in soils of low moisture storage
3	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
4	Selection of suitable crops for rainfed areas
5	Evaluation of different inputs on maize
6	Seed bed preparation for maize
7	Maximization trial on maize, wheat and raya
8	Evaluation of cultural practices given to maize
9	Studies on tillage for seed bed preparation for wheat
10	Studies on evaluation of different inputs and technology in wheat
11	Studies on harvesting of maize at physiological maturity stage in maize-wheat sequence
	Integrated Nutrient Management
12	Manurial requirement of maize – wheat rotation using FYM
13	Fertilizer requirement of maize-wheat sequence
14	Fertilizer requirement of wheat+gram mixture
15	Fertilizer use on rainfed raya
	1979-80
	Rainwater Management
1	Mulching experiment
	Crops and cropping sequence
2	Selection of suitable maize varieties for rainfed areas
3	Selection of suitable crops for rainfed areas
4	Establishment of optimum crop stand in maize and wheat
5	Maximization trial on maize and wheat
6	Studies on evaluation of different inputs and technology in wheat
	Integrated Nutrient Management
7	Fertilizer use on rainfed crops
8	Fertilizer requirement of wheat+gram mixture
9	Fertilizer use on rainfed raya and raya
	1980-81
	Rainwater Management
1	Evaluation of *in situ* moisture conservation practices
2	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
3	Study on selection of suitable fodder for rainfed areas
4	Studies on evaluation of different inputs and technology in maize and wheat

5	Maximization trial on wheat
	Integrated Nutrient Management
6	Studies on N requirement of maize-wheat sequence using FYM
7	Studies on N requirement of maize – wheat sequence in heavy and medium soils
8	Fertilizer use on rainfed crops
	Evaluation of varieties
9	Performance of different varieties of maize for yield and water use
	1981-82
	Rainwater Management
1	Evaluation of *in situ* moisture conservation practices
2	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
3	Study on selection of suitable fodder for rainfed areas
4	Studies on tillage practices for seed bed preparation of maize
5	Maximization trial on wheat and raya
6	Maximization of crop yields under rainfed conditions
	Integrated Nutrient Management
7	P requirement of maize – wheat sequence using FYM
8	N requirement of Maize-wheat sequence
9	P requirement of maize – wheat sequence
10	N & P requirement of wheat+gram mixture
	Evaluation of varieties
11	Evaluation of different wheat varieties under rainfed conditions
	1982-83
	Rainwater Management
1	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
2	Maximization trial on wheat and maize
3	Studies on tillage practices for seed bed preparation of maize
4	Studies on fallow – wheat and maize – wheat rotation on medium soils
	Integrated Nutrient Management
5	Evaluation of different varieties of maize
6	N requirement of sorghum fodder under rainfed conditions
7	Response of different maize varieties to N under dryland conditions
	1983-84
	Rainwater Management
1	Mulching in maize – wheat sequence

2	Studies on supplemental irrigation in wheat
3	In situ moisture conservation practices and their effect on yield in loamy sand soils
	Crops and cropping sequence
4	Selection of suitable crops and varieties for rainfed conditions
5	Maximization trial on maize and wheat
	Integrated Nutrient Management
6	N requirement of maize – wheat sequence with and without FYM
7	P requirement of maize – wheat sequence with and without FYM
	Evaluation of varieties
8	Evaluation of different varieties of maize
	Contingency crop planning
9	Performance of different *rabi* crops in a soil of low moisture retentivity
	1984-85
	Rainwater Management
1	Effect of mulching in maize – wheat sequence
2	In situ moisture conservation practices and their effect on yield
3	Studies on supplemental irrigation in wheat
	Crops and cropping sequence
4	Tillage practices in maize
5	Maximization trial on maize and raya
	Integrated Nutrient Management
6	N requirement of maize – wheat sequence with and without FYM
7	P requirement of maize – wheat sequence with and without FYM
	Evaluation of varieties
8	Evaluation of different varieties of maize
	Contingency crop planning
9	Performance of different *rabi* crops following sorghum fodder in a soil of low moisture retentivity
	1985-86
	Rainwater Management
1	Residual effect of mulch application in maize – wheat sequence
	Crops and cropping sequence
2	Maximization trial on maize, wheat, wheat+gram and raya
3	Role of legume/green manure in crop sequence of N economy
	Integrated Nutrient Management
4	N requirement of maize – wheat sequence with and without FYM
5	P requirement of maize – wheat sequence with and without FYM
	Contingency crop planning

6	Suitability of *rabi* crops on light textured soils
7	Performance of different *rabi* crops following fodder
8	Performance of maize crop on marginal soils
	1986-87
	Crops and cropping sequence
1	Maximization trial on maize, wheat, wheat+gram and raya
	Integrated Nutrient Management
2	Role of legume/green manure in crop sequence of N economy
3	N requirement of maize – wheat sequence with and without FYM
4	P requirement of maize – wheat sequence with and without FYM
5	Performance of graded fertilizer doses in maize and wheat
	Contingency crop planning
6	Suitability of *rabi* crops on light textured soils
	1987-88
	Crops and cropping sequence
1	Maximization trial on maize, wheat and raya
	Integrated Nutrient Management
2	N requirement of maize – wheat sequence with and without FYM
3	P requirement of maize – wheat sequence with and without FYM
4	Performance of graded fertilizer doses in maize and wheat
	Evaluation of varieties
5	Evaluation of wheat varieties under rainfed conditions
	Contingency crop planning
6	Evaluation of alternate crops during the continued drought
7	Identification of suitable *rabi* crop for South Western distt. Of Punjab under rainfed conditions
	1988-89
	Rainwater Management
1	Studies on seepage losses in dugout tanks
	Crops and cropping sequence
2	Maximization trial on maize, wheat and raya
3	Role of legume/green manure in crop sequence of N economy on loamy sand soils
	Integrated Nutrient Management
4	N requirement of maize – wheat sequence with and without FYM
5	P requirement of maize – wheat sequence with and without FYM
6	Performance of graded fertilizer doses in maize and wheat
7	N & P requirement of different cultivars of wheat in wheat + gram mixture on low N &

	Medium P soils
8	Response of wheat to fertilizer N in relation to prefixed water storage at the time of sowing
	Contingency crop planning
9	Suitability of *rabi* crops on light textured soils
10	Identification of suitable crops for low rainfall dryland areas of South Western Punjab
	Evaluation of varieties
11	Local Maize evaluation trial
12	Stability of pure lines and mixtures in wheat
	1990-91
	Rainwater Management
1	Comparative efficiency of life saving irrigation to different *rabi* crops
2	Evaluation of maize – wheat sowing across the slope
	Crops and cropping sequence
3	Evaluation of improved inputs contribution on maize yield
4	Evaluation of *rabi* crops after maize
5	Evaluation of weed control in maize
6	Evaluation of seed treatment technology in wheat
7	Performance of rainfed wheat as affected by seed rate and seed zone moisture
8	Raya intercropping in wheat
	Integrated Nutrient Management
9	Evaluation of N doses in Maize – wheat sequence
10	N requirement of maize varieties
11	Source and method of N application in wheat
	Evaluation of varieties
12	Evaluation of maize varieties
	1991-92
	Rainwater Management
1	Rain water management through different tillage practices in rainfed maize
	Integrated Nutrient Management
2	N use efficiency in relation to time of its application in dryland maize
3	Effect of combined application of organic and inorganic nutrient sources on dryland maize
4	Effect of combined use of organic and inorganic nutrient sources on dryland wheat
5	Response of late sown dryland wheat to N & P
6	Response of dryland wheat to P application
	Evaluation of varieties
7	Response of wheat cultivars to N level on loamy sand and sandy loam soils under

	dryland conditions
8	Response of maize cultivars to N on loamy sand and sandy loam soils
9	Response of bajra cultivars to N under dryland conditions
10	Response of bajra fodder cultivars to N levels under dryland conditons
	1992-93
	Rainwater Management
1	Rainwater management through different tillage practices in maize
2	To study the effect of reducing evaporation losses on wheat yield
3	Harvesting of rain water and recycling
	Integrated Nutrient Management
4	Response of maize cultivars to N application
5	Integrated nutrient management in maize
6	Effect of time of N application on rainfed maize
7	Response of rainfed maize to P application
8	Response of bajra to applied N
9	N response to wheat cultivars
10	INM in rainfed wheat
11	Response of rainfed wheat to P application
12	Wheat response to different fertility levels
13	Response of gram to N & P application
14	Effect of age of green manure crop on rainfed wheat yield
	Evaluation of varieties
15	Evaluation of bajra strains under rainfed conditions
16	Evaluation of bajra strains for their suitability as fodder
17	Evaluation of wheat varieties under rainfed conditions
18	Evaluation of gram strains under rainfed conditions
	1993-94
	Rainwater Management
1	To study the effect of limited irrigation on maize
2	To study the effect of mulch and fertilizer on maize
3	To study the effect of tillage practices on maize
4	Study the effect of conservation at residual moisture on wheat crop
5	Study the effect of vegetative mulches on rainfed sugarcane
6	Effect of vegetative barrier on runoff sediment and crop yield
	Crops and cropping sequence
7	Study the performance of wheat crop sown at different dates
8	Response of sugarcane to weed control
9	To study the response of rainfed sugarcane to sources and levels of N and mulch

	Integrated Nutrient Management
10	To study the response of maize to applied N
11	To study the effect of mode of P application on wheat in maize – wheat sequence
12	To study the effect of P on wheat crop
13	Study on wheat response to potassium
14	Study the effect of INM on wheat
15	Study the response of wheat cultivars to N application
16	Response of wheat to organic and inorganic manuring
17	Study the response of gram to N & P application
18	Response of raya to organic and inorganic manuring
19	To study the response of safflower to P application
20	Response of sugarcane to FYM
	Evaluation of varieties
21	Evaluation of sesame strains (AVT)
22	Evaluation of sesame strains (IVT)
23	Evaluation of arhar strains under rainfed conditions
24	Evaluation of moong strains under rainfed conditions
25	Evaluation of bajra strains for garin yield
26	Testing of bajra strains for forage purpose
27	Evaluation of brassica genotypes under rainfed conditions
28	Testing of wheat genotypes under rainfed conditions
29	Evaluation of advanced strains of barley under rainfed conditions
	Alternate Land Use
30	To study the complementary effect of forest trees on fodder crops.
	1994-95
	Rainwater Management
1	Response of maize to mulch
2	In situ moisture conservation practices
3	Response of wheat to residual profile moisture
4	Effect of vegetative barrier on runoff sediment and crop yield
	Crops and cropping sequence
5	Weed control in maize
6	Method of wheat sowing under rainfed conditions
7	Effect of green manuring in rainfed wheat
	Integrated Nutrient Management
8	Relative performance of N sources in maize
9	Wheat response to sources and doses of N
10	Response of safflower to P application
11	Wheat response to balanced application of fertilizers

12	Wheat response to P in maize - wheat rotation
	Evaluation of varieties
13	Evaluation of sesame genotype under rainfed conditions (AVT)
14	Evaluation of sesame genotype under rainfed conditions (IVT)
15	Evaluation of Mash strains under rainfed conditions
16	Evaluation of moong strains under rainfed conditions
17	Response of maize to organic and inorganic manuring
18	Evaluation of wheat genotype under rainfed conditions (AVT)
19	Evaluation of wheat genotype under rainfed conditions (IVT)
20	Evaluation of triticale genotype under rainfed conditions
21	Evaluation of gram genotype under rainfed conditions
22	Evaluation of raya genotype (station trial)
23	Evaluation of raya genotype (coordinated trial)
24	Screening of raya genotypes for rainfed conditions
25	Evaluation of safflower genotypes for *kandi* raea
	Contingency crop planning
26	Crop performance on light texture soils
27	Selection of crops for loamy sand soils
	Alternate Land Use
28	To study the complementary effect of forest trees on fodder crops.
	Energy Management
29	Testing, evaluation and modification of existing dryland seeding implements suitable to local conditions of *kandi* area
	1995 -96
	Rainwater Management
1	Conservation of residual moisture by checking evaporation
2	Effect of vegetative barrier on runoff sediment and crop yield
	Crops and cropping sequence
3	Relative performance of wheat varieties sown at different dates
4	Response of sugarcane to seed rate and spacing
5	Response of rainfed sugarcane to weed control
6	Response of wheat to depth of sowing
7	Response of maize to tillage practices
	Integrated Nutrient Management
8	Response of maize to P in maize – wheat rotation
9	Response of maize to sources of N
10	Response of maize to organic and inorganic N
11	Response of wheat to N source
12	Wheat response to P application

13	Wheat response to varying levels of soil fertility levels
14	Response of sesame to N application
15	Wheat response to K application
	Evaluation of varieties
16	Evaluation of sesame genotype under rainfed conditions (AVT)
17	Evaluation of sesame genotype under rainfed conditions (IVT)
18	Evaluation of castor strains under rainfed conditions
19	Evaluation of moong strains under rainfed conditions
20	Response of maize varieties to N application
21	Evaluation of triticale strains
22	Evaluation of barley
23	Evaluation of lentil strains
24	Developing suitable late sown wheat variety (AVT & IVT)
25	Evaluation of brassica strains (Ray I, II & III)
	Contingency crop planning
26	Performance of maize under late season drought conditions
27	Performance of different crops on marginal soils
	Alternate Land Use
28	Performance of fodder crops in agroforestry system
	1997-98
	Rainwater Management
1	Response of maize to in situ raised mulch
2	Wheat as influenced by conservation of residual soil moisture by checking evaporation
3	Response of sugarcane to mulch and N application
	Crops and cropping sequence
4	Effect of weeding methods on maize yield
5	Response of maize and wheat to tillage practices
6	Relative performance of wheat varieties sown at different dates
7	Wheat response to sowing methods
8	Response of sugarcane to spacing and seed rate
	Integrated Nutrient Management
9	Response of maize to FYM and N fertilizers and its residual effect on grain yield of wheat
10	Response of maize varieties to N
11	Response of maize and wheat to P application in maize – wheat rotation
12	Response of sesame to fertilizers
13	Safflower response to soil fertility
14	Time of N application to wheat

15	Response of safflower to P application
16	Response of sugarcane to FYM and N application
17	Response of napier bajra hybrid to N fertilizers
18	Performance of various cropping sequences on marginal soils
	Evaluation of varieties
19	Relative performance of linseed varieties
20	Relative performance of different grasses
	Contingency crop planning
21	Performance of various crops on marginal soils
	1998-99
	Rainwater Management
1	Response of sugarcane to mulch and N application
	Crops and cropping sequence
2	Low till farming strategies for resource conservation and improving soil fertility
	Integrated Nutrient Management
3	Integrated nutrient management for rainfed semi arid tropics
4	Response of maize and wheat to P application in maize-wheat rotation
5	Time of N application to wheat
6	Response of safflower to fertilizer application
7	Sugarcane response to FYM and N application
	Evaluation of varieties
8	Relative performance of different grasses under various N levels
	Contingency crop planning
9	Performance of various *kharif* crops on medium texture soils
10	Performance of various cropping sequences on light texture soils
	1999 - 2000
	Crops and cropping sequence
1	Low till farming strategies for resource conservation and improving soil fertility
	Integrated Nutrient Management
2	Integrated nutrient management for rainfed semi arid tropics
3	Response of maize and wheat to P application in maize-wheat rotation
4	Response of napier bajra hybrid to N fertilizers
5	Residual effect of N fertilizers on yield of napier bajra hybrid
	Evaluation of varieties
6	Relative performance of different grasses under various N levels
7	Relative performance of advanced linseed varieties under rainfed situations
	Contingency crop planning
8	Performance of various *kharif* crops on medium texture soils

	2000-01
	Crops and cropping sequence
1	Low till farming strategies for resource conservation and improving soil fertility
	Integrated Nutrient Management
2	Integrated nutrient management for rainfed semi arid tropics
3	Response of maize and wheat to P application in maize-wheat rotation
4	Response of maize and wheat to N application and bio fertilizers
	Contingency crop planning
5	Performance of various *kharif* crops on medium texture soils
	2001-02
	Rainwater Management
1	Efficient and economic use of limited irrigation water
	Crops and cropping sequence
2	Low till farming strategies for resource conservation and improving soil fertility
3	Evaluation of weed control method in maize
4	Evaluation of weed control methods in moong
	Integrated Nutrient Management
5	Integrated nutrient management for rainfed semi arid tropics
	Evaluation of varieties
6	Relative performance of advanced linseed varieties under rainfed situations
7	Relative performance of initial linseed varieties under rainfed situations
	Contingency crop planning
8	Performance of various *kharif* crops on medium texture soils
	2002-03
	Crops and cropping sequence
1	Low till farming strategies for resource conservation and improving soil fertility
2	Effect of weed control practices on the productivity of green gram
3	Intercropping of maize with moong and mash
4	Seed rate and row spacing in Lentil
5	Effect of preceding crops on the productivity of chickpea and mustard
	Integrated Nutrient Management
6	Effect of organic and inorganic fertilizers on the productivity of different crops in cropping sequence
7	Effect of graded doses of N & P on the productivity of greengram
8	Seed inoculation and doses of nutrients (N and P) in lentil
9	Effect of graded doses of N & P on the productivity of component crops in maize + moong intercropping system

	Evaluation of varieties
10	Evaluation of bread and durum wheat cultivars
	2003-04
	Crops and cropping sequence
1	Low till farming strategies for resource conservation and improving soil quality
2	Effect of weed control practices in green gram and black gram
3	Crop Geometry Studies
4	Intercropping studies in maize
5	Effect of sowing dates, varieties and seed rates in chickpea
6	Seed rate and row spacing in Lentil
7	Row spacing and seed depth in barley
8	Row spacing and seed depth in raya
	Integrated Nutrient Management
9	Effect of organic and inorganic fertilizers on the productivity of different crops in cropping sequence
10	Improving productivity of maize-wheat cropping sequence through integrated nutrient management practices
11	Comparative performance of varying levels of vermicompost in wheat
12	Response of new barley genotypes to nitrogen levels
13	Effect of different levels of phosphorus on the productivity of green gram cultivars
14	Seed inoculation and doses of nutrients (N and P) in lentil
	Evaluation of cultivars
15	Evaluation of barley cultivars
16	Evaluation of raya cultivars
17	Evaluation of linseed cultivars
18	Contigency crop planning
19	Date of sowing for winter crops
	2004-05
	Crops and cropping sequence
1	Effect of varying spacing on the productivity of maize hybrids under rainfed conditions
2	Effect of varying spacing on the productivity of castor under rainfed conditions
3	Effect of varying seed rate on chickpea cultivars at different dates of sowing under rainfed conditions
4	Studies on intercropping of green/black gram in maize
5	Effect of weed control measures in green/black gram under rainfed conditions
	Integrated Nutrient Management
6	Effect of tillage and sources of nitrogen on the crop productivity in maize-wheat

	cropping sequence under dryland conditions
7	Integrated nutrient management practices in maize/mash-wheat/lentil cropping system under dryland conditions
8	Comparative performance of organic and inorganic sources of nutrition on isabgol under rainfed conditions
9	Effect of varying fertility levels on the productivity of green gram cultivars under rainfed conditions
	Contingency crop planning
10	Contingency crop planning for seasonal drought under late sown conditions
	Integrated Farming System
11	Study on bio-diverse model for *Kandi* area
	2005-06
	Rainwater Management
1	To study the effect of in-situ rain water harvesting and moisture conservation technology in Amla
2	Effect of spacing and mulching on yield and quality of Aloe vera under rainfed conditions
3	Effect of spacing and mulching on growth and yield of lemon grass under rainfed conditions
	Crops and cropping sequence
4	Effect of crop residue management practices on crop growth and yield in maize-wheat/raya/lentil cropping sequence
5	Effect of varying spacing on the productivity of maize hybrids under rainfed conditions
6	Studies on intercropping of black gram in maize
	Integrated Nutrient Management
7	Effect of tillage and sources of nitrogen on the crop productivity of maize-wheat cropping sequence under dryland conditions
8	Integrated nutrient management practices in maize/mash-wheat/lentil cropping systems under dryland conditions
	Contingency crop planning
9	Effect of different rainy season crops on the productivity, profitability and sustainability of rainfed *rabi* crops
10	Contingency crop planning for seasonal drought under late sown conditions
	2006-07
	Rainwater Management
1	Effect of spacing and mulching on growth and yield of lemon grass under rainfed conditions

2	To study the effect of in-situ rain water harvesting and moisture conservation technology in *Amla*
	Crops and cropping sequence
3	Effect of varying spacing on the productivity of maize hybrids under rainfed conditions
4	Effect of seed rates on the productivity of chickpea cultivars sown on different dates
5	Effect of crop residue management practices on crop growth and yield in maize-wheat/raya/lentil cropping sequence
	Integrated Nutrient Management
6	Effect of tillage and sources of nitrogen on the crop productivity of maize-wheat cropping sequence under dryland conditions
7	Integrated nutrient management practices in maize/mash-wheat/lentil cropping systems under dryland conditions
8	Response of mustard genotypes to nitrogen fertilization under different dates of sowing in rainfed conditions
	Contingency crop planning
9	Effect of different rainy season crops on the productivity, profitability and sustainability of rainfed *rabi* crops
10	Contingency crop planning for seasonal drought under late sown conditions
	2007-08
	Rainwater Management
1	Effect of spacing and mulching on growth and yield of lemon grass under rainfed conditions
2	To study the effect of in-situ rain water harvesting and moisture conservation technology in *Amla*
	Crops and cropping sequence
3	Effect of crop residue management practices on crop growth and yield in maize-wheat/raya/lentil cropping sequence
4	Effect of varying spacing on the productivity of maize hybrids under rainfed conditions
	Integrated Nutrient Management
5	Effect of tillage and sources of nitrogen on the crop productivity of maize-wheat cropping sequence under dryland conditions
6	Integrated nutrient management practices in maize-wheat cropping system under dryland conditions
7	Response of mustard genotypes to nitrogen fertilization under different dates of sowing in rainfed conditions
	Contingency crop planning
8	Effect of different rainy season crops on the productivity, profitability and

	sustainability of rainfed *rabi* crops
9	Contingency crop planning for seasonal drought under late sown conditions
	2008-09
	Rainwater Management
1	Effect of vegetative barriers on soil loss, runoff and nutrients
	Crops and cropping sequence
2	Effect of different *kharif* season crops on the productivity, profitability and sustainability of rainfed *rabi* crops
	Integrated Nutrient Management
3	Effect of phosphorus + sulphur and seed inoculation on chickpea under rainfed conditions
4	Response of *Brassica* genotypes to N fertilization under different dates of sowing
5	Integrated nutrient management practices in maize-wheat cropping system under rainfed semi-arid tropics
6	Effect of tillage and sources of nitrogen on the crop productivity in maize-wheat cropping sequence under dryland conditions
	Contingency crop planning
7	Contingency crop planning for seasonal drought under late sown conditions in light textured soils
	Integrated Farming System
8	Integrated farming system model for *Kandi* area
9	Agricultural Crop Based Integrated Farming System
	Energy Management
10	Effect of precision levelling on runoff and soil loss under rainfed conditions
	2009-10
	Rainwater Management
1	Effect of vegetative barriers on soil loss, runoff and nutrients
2	Monitoring of Makkowal type water harvesting system
3	Identification of locally available material for mulching
	Crops and cropping sequence
4	Studies on effect of thiourea application on rainfed wheat
5	Studies on paired row intercropping of greengram, blackgram and sesamum in maize
6	Response of rainfed chickpea to seed priming with molybdenum (Mo)
	Contingency crop planning
7	Contingency crop planning for seasonal drought under late sown conditions in medium textured soil
	Integrated Nutrient Management

8	Effect of Phosphorus + sulphur and biofertilizers on chickpea under rainfed conditions
9	Integrated nutrient management practices in maize-wheat cropping system under rainfed semi-arid tropics
10	Integrated nutrient management practices in maize/mash-wheat/lentil cropping systems under dryland conditions
11	To evaluate the N requirement for Toria, Gobhi Saron and Toria+ Gobhi Saron intercropping system under rainfed conditions
	Evaluation of varieties
12	Screening of cowpea lines under drought conditions.
13	Screening germplasm lines for fodder and pearlmillet grains (dual purpose)
14	Screening of locally available lines of dual purpose maize lines for drought tolerance
15	Screening of Lucerne lines
16	Screening of barley lines for fodder and grain
	Energy Management
17	Effect of tillage and sources of nitrogen on the crop productivity in maize-wheat cropping sequence under dryland conditions
18	Effect of precision levelling on runoff and soil loss in maize-wheat cropping system under rainfed condition
	Alternate Land Use
19	Development of agro-horticulture and olericulture with the efficient use of water (drip and sprinkler system).
	Integrated Farming System
20	Viability of Integrated farming system model for *Kandi* area – Situation-I
21	Agricultural Crop Based Integrated Farming System – Situation-II
	2009-10
	Rainwater Management
1	Effect of vegetative barriers on soil loss, runoff and nutrients
2	Monitoring of Makkowal type water harvesting system
3	Identification of locally available material for mulching
	Contingency crop planning
4	Contingency crop planning for seasonal drought under late sown conditions in medium textured soil
	Crops and cropping sequence
5	Studies on effect of thiourea application on rainfed wheat
6	Response of rainfed chickpea to seed priming with molybdenum (Mo)
7	Studies on paired row intercropping of greengram, blackgram and sesamum in maize

	Integrated Nutrient Management
8	Effect of Phosphorus + sulphur and biofertilizers on chickpea under rainfed conditions
9	To evaluate the N requirement for Toria, Gobhi Saron and Toria+ Gobhi Saron intercropping system under rainfed conditions
	Evaluation of varieties
10	Screening of cowpea lines under drought conditions.
11	Screening germplasm lines for fodder and pearlmillet grains (dual purpose)
12	Screening of locally available lines of dual purpose maize lines for drought tolerance
13	Screening of Lucerne lines
14	Screening of barley lines for fodder and grain
	Energy Management
15	Effect of tillage and sources of nitrogen on the crop productivity in maize-wheat cropping sequence under dryland conditions
16	Effect of precision levelling on runoff and soil loss in maize-wheat cropping system under rainfed condition
	Alternate Land Use
17	Development of agro-horticulture and olericulture with the efficient use of water (drip and sprinkler system).
	Integrated Farming System
18	Viability of Integrated farming system model for *Kandi* area – Situation-I
19	Agricultural Crop Based Integrated Farming System – Situation-II
	2010-11
	Rainwater Management
1	Effect of vegetative barriers on soil loss, runoff and nutrients
2	Monitoring of Makkowal type water harvesting system
3	Identification of locally available material for mulching
	Contingency crop planning
4	Contingency crop planning for seasonal drought under late sown conditions in medium textured soil
	Crops and cropping sequence
5	Studies on effect of thiourea application on rainfed wheat
6	Studies on paired row intercropping of greengram, blackgram and sesamum in maize
7	Response of rainfed chickpea to seed priming with molybdenum (Mo)
	Integrated Nutrient Management
8	Effect of Phosphorus + sulphur and biofertilizers on chickpea under rainfed conditions

9	To evaluate the N requirement for Toria, Gobhi Saron and Toria+ Gobhi Saron intercropping system under rainfed conditions
	Evaluation of varieties
10	Screening of cowpea lines under drought conditions.
11	Screening germplasm lines for fodder and pearlmillet grains (dual purpose)
12	Screening of locally available lines of dual purpose maize lines for drought tolerance
13	Screening of Lucerne lines
14	Screening of barley lines for fodder and grain
	Energy Management
15	Effect of tillage and sources of nitrogen on the crop productivity in maize-wheat cropping sequence under dryland conditions
16	Effect of precision levelling on runoff and soil loss in maize-wheat cropping system under rainfed condition
17	Effect of Rotavator and INM on maize-wheat cropping system under rainfed conditions
	Alternate Land Use
18	Development of agro-horticulture and olericulture with the efficient use of water (drip and sprinkler system).
	Integrated Farming System
19	Viability of Integrated farming system model for *Kandi* area – Situation-I
20	Agricultural Crop Based Integrated Farming System – Situation-II

Annexures 2

List of contributors (Chief scientists and scientists) since inception of the centre

1 Dr. Ranjodh Singh, Soil Scientist
2 Dr. Nathu Singh, Asstt. Agronomist
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28 Dr. Sher Singh, Asstt. Agronomist
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31 Dr. Anil Khokhar, Asstt. Agronomist

Annexures 3

Contingency crop plans

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri ACZ: Hot dry/moist sub humid AESR: 9.1 Soil Type: Inceptisoles
Annual Average Normal Rainfall: 1094.3 (mm)
Normal date of onset of monsoon: 1 July (27 SMW) Crop/ Cropping System: Maize

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	***In-situ/ex-situ* moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha) & Economics**
No stress. (Sowing time 20-30th June)	Hybrids: Parkash, PMH-2 Composites Megha (82-84 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Bavistan /Derosal/ Agrozim 50 WP@ 3g /kg seed to prevent seed rot and seedling blight Rs. 75/ha	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	Sowing across the slopes Compartmenta-lization of fields Earthling at knee height stage (25 to 30 DAS (31 SMW) Rs.1000/ha	At sowing NPK:40+40+20 kg/ha Cost: Rs. 950/ha At knee hieght stage: 40 N kg/ha Cost: Rs. 550/ha.	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs..560 to m 830/ha) followed by earthing –	**Maize borer:** Spray Sumicidin 20 EC(fenvalerate) @ 100 ml/ha or Ripcord 10 EC (cypermethrin)@ 100 ml/ha or Decis(Deltamethrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant	In heavy soils provide drainage during first 15 days of the crop	GY: 25 to 35 q/ha B:C=1.91 -2.48

		Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually					up at knee hieght stage	debris and keep the field well drained		
Normal onset and early stress during first fortnight (28 and 29 SMW) (Sowing time 20-30th June)	Hybrids: Parkash, PMH-2 Composites Megha (82-84 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	Bavistan /Derosal/ Agrozim 50 WP@ 3g /kg seed to prevent seed rot and seedling blight Rs. 75/ha	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	Sowing across the slopes Compartmenta-lization of fields Earthling at knee height stage (25 to 30 DAS (31 SMW) Rs.1000/ha	At sowing NPK:40+40+20 kg/ha Cost: Rs. 950/ha At knee hieght stage: 40 N kg/ha Cost: Rs. 550/ha.	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	**Maize borer:** Spray Sumicidin 20 EC(fenvalerate) @ 100 ml/ha or Ripcord 10 EC (cypermethrin)@ 100 ml/ha or Decis(Deltamethrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	*In heavy soils provide* drainage during first 15 days of the crop Low plant population and there is no possibility of gap filling	GY: 20-25 q/ha B:C=1.58-2.14
Normal onset and Mid season	Hybrids: Parkash, PMH-2	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21	Bavistan/Deroal/ Agrozim @ 3g /kg seed	20 kg/ha 45x15 cm	Sowing across the slopes Compartment	At sowing NPK:40+40+20 kg/ha	Weeding with wheel hoe (Rs. 400/ha) or	**Maize borer:** Spray Decis(Deltamethrin) 2.8 EC@ 200	*In heavy soils provide* drainage	GY: 18-22 q/ha

stress at 45 DAS (33 to 34 SMW) (Sowing time 20-30th June)	Composites Megha (82-84 days duration)	SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	to prevent seed rot and seedling blight Rs. 75/ha	For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	a-lization of fields Earthling at knee height stage (25 to 30 DAS (31 SMW) Rs.1000/ha	Cost: Rs. 950/ha At knee hieght stage: 40 N kg/ha Cost: Rs. 550/ha.	One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	during first 15 days of the crop Supplemental irrigation, if available Removal of less vigorous plants up to 20% and use as fodder	B:C=1.44 -1.93
Normal onset and Terminal stress at 60 to 70 DAS (grain filling stage) (36 to 37 SMW) (Sowing time 20-	Hybrids: Parkash, PMH-2 Composites Megha (82-84 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27	Bavistan/Deroal/ Agrozim @ 3g /kg seed to prevent seed rot and seedling blight Rs. 75/ha	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha	Sowing across the slopes Compartmenta-lization of fields Earthling at knee height stage (25 to 30 DAS (31 SMW) Rs.1000/ha	At sowing NPK:40+40+20 kg/ha Cost: Rs. 950/ha At knee hieght stage: 40 N kg/ha Cost: Rs. 550/ha.	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply	**Maize borer:** Spray Decis(Deltamethrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water	One supplemental irrigation, if available (Rs. 300 to 550) Removal of cobless plants	GY: 18-22 q/ha B:C=1.44 -1.93

30th June)		& 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually		Local: Rs.200/ha			atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	**Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	and use as fodder	

Delayed onset of monsoon: 15 July (29 SMW) Crop: Maize

Delayed onset of monsoon & no stress (29 & 30 SMW) (Sowing Time:2nd fortnight of July)	Hybrids: Parkash, PMH-2 JH-3459 Composites Megha (82-84 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	Bavistan/Deroal/ Agrozim @ 3g /kg seed to prevent seed rot and seedling blight Rs. 75/ha	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	Sowing across the slopes Compartmenta-lization of fields Earthling at knee height stage (25 to 30 DAS (32 to 33 SMW) Rs.1000/ha	At sowing NPK:40+40 +20 kg/ha Cost: Rs. 950/ha At knee hieght stage: 40 N kg/ha Cost: Rs. 550/ha.	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs..560 to m 830/ha) followed by earthing – up at knee hieght stage	**Maize borer:** Spray Decis(Deltametrhrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	In heavy soils provide drainage during first 15 days of the crop	GY: 23 to 28 **q/ha** B:C=1.78 -2.35
Delayed onset of monsoon & Early stress during first fortnight (30 and 31	Hybrids: Parkash, PMH-2 JH-3459 Composites Megha	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field	Bavistan/Deroal/ Agrozim @ 3g /kg seed to prevent seed rot and	20 kg/ha 45x15 cm For varieties, composites and hybrids	Sowing across the slopes Compartmenta-lization of fields	At sowing NPK:40+40 +20 kg/ha Cost: Rs. 950/ha At knee hieght	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa	**Maize borer:** Spray Decis(Deltametrhrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L	*In heavy soils provide* drainage during first 15 days of the crop	GY: 18-20 q/ha B:C=1.44 -1.78

SMW)) (Sowing Time:2nd fortnight of July)	(82-84 days duration)	bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	seedling blight Rs. 75/ha	Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	Earthling at knee height stage (25 to 30 DAS (32 to 33 SMW) Rs.1000/ha	stage: 40 N kg/ha Cost: Rs. 550/ha.	2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	Thinning of closely spaced plants , if any Wherever necessary , one life Saving irrigation, if available For low plant population and there is no possibility of gap filling	

Delayed onset of monsoon & Midseason stress at 45 DAS (35 to 36 SMW) (Sowing Time: 2nd fortnight of July)	Hybrids: Parkash, PMH-2 JH-3459 Composites Megha (82-84 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	Bavistan/Deroal/ Agrozim @ 3g /kg seed to prevent seed rot and seedling blight Rs. 75/ha	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost: Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	Sowing across the slopes Compartmenta-lization of fields	At sowing NPK:40+40 +20 kg/ha Cost: Rs. 950/ha Depending up on the effective rainfall , 40 N kg/ha Cost: Rs. 550 /ha.	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	**Maize borer:** Spray Decis(Deltamethrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water **Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	Soil mulching with wheel hoe (Rs.500/ha) Supplemental irrigation, if available Removal of less vigorous plants up to 20% and use as fodder	GY: 12-15 q/ha B:C=1.00 -1.52
Delayed onset of monsoon & Terminal stress at 60-70 DAS (38 & 39 at grain filling	Hybrids: Parkash, PMH-2 JH-3459 Composites Megha	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds.	Bavistan/Deroal/ Agrozim @ 3g /kg seed to prevent seed rot and seedling	20 kg/ha 45x15 cm For varieties, composites and hybrids Cost:	Sowing across the slopes Compartmenta-lization of fields Earthling at	At sowing NPK:40+40 +20 kg/ha Cost: Rs. 950/ha At knee height	Weeding with wheel hoe (Rs. 400/ha) or One manual hoeing with kurpa 2 weeks	**Maize borer:** Spray Decis(Deltamethrin) 2.8 EC@ 200 ml/ha or Sevin 50 WP (carbaryl) 250 g/ha in 150 L water	Supplemental irrigation, if available If irrigation is not possible, harvest	GY: 23-28 q/ha B:C=1.78 -2.35 with supplemantal irrigation or

stage SMW) (Sowing Time: 2nd fortnight of July)	(82-84 days duration)	After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Rs.3000/ha Compartmentalization of fields either with tractor drawn ridger or bullock drawn mould board plough or manually	blight Rs. 75/ha	Hybrids: 1400/ha Composites: 500/ha Local: Rs.200/ha	knee height stage (25 to 30 DAS (31 SMW) Rs.1000/ha	stage , 40 N kg/ha Cost: Rs. 550 /ha.	after sowing (cost: Rs.2640/ha) or apply atrazine @ 1.25 to 2 kg/ha as pre-emergence (Rs. 560 to 830 /ha) followed by earthing – up at knee hieght stage	**Jassid/Thrips**: Rogor 30 EC (Dimethoate)@ or Metasystox 25 EC 500 ml /ha in 125 L water **Bacterial stalk:** Destroy the diseased plant debris and keep the field well drained	the crop for fodder purpose.	50 q/ha dry fodder if harvested for fodder purpose

Maize is not recommended after July.
Source of seed

Composites/Hybrids:	
Parkash, PMH-2 , JH-3459	**Ludhiana, PAU**
Megha	

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Delayed onset of monsoon by 30 days (31 SMW) Crop: Pearlmillet (fodder)

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	***In-situ/ex-situ* moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other/ Remarks**	**Expected green fodder yield (t/ha)**
Delayed onset and No stress stress (31 SMW) (Sowing : 1st week of August)	PCB - 164 and FBC - 16	Summer ploughing in May/June. Cost:Rs.1000/ha After receiving monsoon rains, ploughing (1) and planking (1) of fields followed by sowing (31 SMW). Repair of bunds and compartmentalization of fields Cost: Rs. 2000/ha	Agrozim+thiram/Captan (1:1) @ 3g /kg seed to prevent seed rot and seedling mortality	15-20 kg/ha Cost: Rs. 300-400/ha Spacing Rows: 22.5 cm	Sowing across the slopes Compartmentalization of field	25 kg N/ha followed by 25 kg N/ha 3 weeks after sowing Cost: Rs. 700/ha	Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	Results: Low residual profile moisture for succeeding *rabi* crops	Fodder yield: 45-50 t/ha B:C=2.13 -2.44
Delayed onset and early stress stress (10-15	PCB - 164 and FBC - 16	Summer ploughing in May/June. Cost:Rs.1000/ha After receiving monsoon rains, ploughing (1) and	Agrozim+thiram/Captan (1:1) @ 3g /kg seed to prevent seed rot and seedling mortality	15-20 kg/ha Cost: Rs. 300-400/ha	Sowing across the slopes Compartmentalization of field	25 kg N/ha followed by 25 kg N/ha 3 weeks after	Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50	Results: Low residual profile moisture for	Fodder yield: 40-45 t/ha B:C=1.97 -2.16

DAS) (33 SMW) (Sowing : 1st week of August)		planking (1) of fields followed by sowing (31 SMW). Repair of bunds and compartmentalization of fields Cost: Rs. 2000/ha		Spacing Rows: 22.5 cm		sowing Cost: Rs. 700/ha	water as pre-emergence on moist soil surface	WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	succeeding *rabi* crops	
Delayed onset and Mid season stress (25-30 DAS) (35 SMW) (Sowing : 1st week of August)	PCB - 164 and FBC - 16, 50-60 days duration	Summer ploughing in May/June. Cost:Rs.1000/ha After receiving monsoon rains, ploughing (1) and planking (1) of fields followed by sowing. Repair of bunds and compartmentalization of fields Cost: Rs. 2000/ha	Agrozim+thiram/ captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality	15-20 kg/ha Cost: Rs. 300-400/ha Spacing Rows: 22.5 cm	Sowing across the slopes Compartmentalization of field	25 kg N/ha followed by 25 kg N/ha 3 weeks after sowing Cost: Rs. 700/ha	Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	Results: Low residual profile moisture for succeeding *rabi* crops	FY: 35-45 t/ha B:C=1.79 -2.16
Delayed onset and terminal stress stress	PCB - 164 and FBC - 16	Summer ploughing in May/June. Cost:Rs.1000/ha After receiving monsoon rains,	Agrozim+thiram/ captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality	15-20 kg/ha Cost: Rs. 300-	Sowing across the slopes Compartmentalization of field	25 kg N/ha followed by 25 kg N/ha 3 weeks	Spray Atratf 50 WP (atrazine) @ 500 g/ha in	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or	Results: Low residual profile moisture	Fodder yield: 40-45 t/ha B:C=1.97 -2.16

(45-50 DAS) (38 SMW) (Sowing : 1st week of August)		ploughing (1) and planking (1) of fields followed by sowing (31 SMW). Repair of bunds and compartmentalization of fields Cost: Rs. 2000/ha		400/ha Spacing Rows: 22.5 cm		after sowing Cost: Rs. 700/ha	500 L water as pre-emergence on moist soil surface	Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	for succeeding *rabi* crops	

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Normal date of onset of monsoon: 1 July (27 SMW) **Crop:** Pearlmillet (Grain)

Situation	Varities	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	*In-situ/ex-situ* moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other/ Remarks	Expected yield (q/ha)
Normal onset and No stress. (Sowing : 1st fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed		GY: 25-30 B:C=2.41-2.89

Normal onset and Early stress (20 DAS) (30SMW) (Sowing : 1st fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Weeding with wheel hoe 3 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	Gap filling by thinning In the same field on a rainy day of 20 mm Cost: Rs. 500	GY: 25-30 B:C=2.30-2.84
Normal onset and Midseason Max.tillering stage (40-45 DAS) (33& 34	Hybrids PHB-2168, PHB 47 Composite :	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/h	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality	3.75 kg/ha Cost: Rs.115 Spacing Rows:	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP	Supplemental irrigation ,if available Long dry spell at this stage,	GY: 25-30 B:C=2.41-2.99 GY:15-20 B:C=1.76-2.33 (without

SMW) (Sowing : 1st fortnight of July)	PCB 164, (80-85 days duration)	a Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Cost: Rs. 20	50 cm Plants:15 cm after thinning		followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	(carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	remove every third row for fodder	supplemental irrigation)
Normal onset and Terminal stress At 60-70 DAS (grain filling stage) (36 & 37 SMW) (Sowing : 1st fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.143	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1)	Supplemental irrigation ,if available	GY: 25-30 B:C=2.30-2.84 GY:18-22 B:C=1.95-2.43 (without supplemental irrrign)

		by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha				0	emergence on moist soil surface Cost: Rs. 310/ha	@ 3g /kg seed		

Delayed onset of monsoon: 15-30 July (29 to 30 SMW) Crop: Pearlmillet (Grain)

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	***In-situ/ex-situ* moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress l stress (29 & 30 SMW) (Sowing : 2nd fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost: Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	-	GY: 25-30 B:C=2.41-2.99
Delayed onset and Early stress	Hybrids PHB-2168, PHB 47	Summer ploughing one in May with a rainfall of 20 mm	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot	3.75 kg/ha Cost: Rs.115	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30	Weeding with wheel hoe 3 weeks after	**Grass hopper:** Dusting of Malathion 5 % @ 25	Thinning of closely spaced plants	GY: 25-30 B:C=2.30-2.84

(20 DAS) (32 SMW) (Sowing : 2nd fortnight of July)	Composite : PCB 164, (80-85 days duration)	(18 SMW to 21 SMW) Cost: Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	and seedling mortality Cost: Rs. 20	Spacing Rows: 50 cm Plants:15 cm after thinning		kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed		
Delayed onset and Mid season l stress (40 DAS) (35 & 36 SMW) (Sowing : 2nd fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost: Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1)	Supplemental irrigation, if available Thinning of closely spaced plants Long dry spell at this stage, remove every third row for fodder	GY: 25-30 B:C=2.41-2.99 GY:15-20 B:C=1.76-2.33 (without supplemental irrrign)

		(2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha				Rs.1430	pre-emergence on moist soil surface Cost: Rs. 310/ha	@ 3g /kg seed		
Delayed onset and Terminal stress at 60-70 DAS (38 SMW) (Sowing : 2nd fortnight of July)	Hybrids PHB-2168, PHB 47 Composite : PCB 164, (80-85 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Agrozim+thiram / captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	Supplemental irrigation ,if available	GY: 25-30 B:C=2.30-2.84 GY:18-22 B:C=1.95-2.43 (without supplemental irrrign)

Delayed onset of monsoon by 30 days (31 SMW) Crop: Pearlmillet (Grain)

Situation	Varities	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	***In-situ/ex-situ* moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress stress (31 SMW) (Sowing : 1st week of August)	Composite: PCB 164, (80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Agrozim+thiram/ captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15 cm after thinning	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about 4 weeks after sowing Cost Rs.1430	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP (atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed	-	GY: 20-25 B:C=1.95-2.56
Delayed onset and Mid season stress (40 DAS) (37 SMW) (Sowing :	PCB 164,	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds.	Agrozim+thiram/ captan(1:1) @ 3g /kg seed to prevent seed rot and seedling mortality Cost: Rs. 20	3.75 kg/ha Cost: Rs.115 Spacing Rows: 50 cm Plants:15	Sowing across the slopes Compartmenta-lization of field	At sowing :apply 32 kg N+ 30 kg P_2O_5 /ha followed by 32 kg N /ha about	Weeding with wheel hoe 4 weeks after sowing (Rs. 400/ha) or Spray Atratf 50 WP	**Grass hopper:** Dusting of Malathion 5 % @ 25 kg/ha or Sevin 50 WP (carbaryl) **Green ear or Downy**	Harvest the crop for fodder And conserve moisture for *rabi* crops	Fodder yield: 30 t/ha B:C=1.71-1.88

1st week of August)		After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha		cm after thinning		4 weeks after sowing Cost Rs.1430	(atrazine) @ 500 g/ha in 500 L water as pre-emergence on moist soil surface Cost: Rs. 310/ha	**mildew:** Sow resistant varieties **Grain smut:** Treat the seed with Thiram/ Captan(1:1) @ 3g /kg seed		

Source of seed

Composites/Hybrids:	
PHB- 2168, PHB 47 PCB 164,	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal-Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles

Normal withdrawl of monsoon: II Fortnight of September (38 and 39 SMW) and normal *rabi* (end Oct to Mid Nov) (43 and 44 SMW)

Crop: Wheat after maize

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (Kg/ha)
Normal withdrawal of monsoon and normal *rabi* (Sowing time: 4th week of October to 3rd week of November)	PBW 175 PBW 527	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing with bullock drawn *pora* or modified tractor drawn seed drill. in 43 and 44 SMW . Cost: Rs. 3000 to 4000/ha	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Bavistan/Deroal/ Agrozim @ 2.5 g /kg seed or Raxil @ 1g /kg seed to prevent crop from Flag/loose smut disease. Cost: Rs. 200/ha	100 Cost: Rs.1750/ha Row spacing:22.5 cm	Ploughing (2) & planking of fields immediate after harvest will take care Creation of soil mulch during weeding	Drilled NPK:40+ 40+30 kg/ha at sowing and 40 kg N /ha about 30-60 DAS with winter rain Total Cost: Rs. 2000/ha Half dose of NPK in light soils Cost: Rs.1150 /ha	One hoeing with kurpa 4-6 weeks after sowing (Rs. 2200/ha) Or Spray 2,4-D @ 875g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.450/ha**	**Termite:** Treat the seed before sowing with Dursban (chlorpyriphos) 20 EC @ 4 ml /kg seed **Aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox 25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PBW 175	One presowing irrigation ,if available, to be given in low soil moisture condition	GY: 25-30 B:C=2.50-3.77
Normal withdrawal of monsoon , normal	PBW 175 PBW 527	Two ploughings (38 and 39 SMW) &	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed	100 Cost: Rs.1750/ha	Ploughing (2) & planking of fields immediate	Drilled NPK:40+ 40+30 kg/ha at	One hoeing with kurpa 4-6 weeks	**Termite:** Treat the seed before sowing with Dursban	One supplemental irrigation ,if available, to	GY: 20-25 B:C=2.00-3.14 GY:10-15

rabi and water deficit during reproductive growth stage (3 to 4 SMW) (Sowing time: 4th week of October to 3rd week of November)		planking immediately after harvest of maize and sowing with bullock drawn *pora* or modified tractor drawn seed drill. in 43 and 44 SMW . Cost: Rs. 3000 to 4000/ha	followed by Bavistan/Deroal/ Agrozim @ 2.5 g /kg seed or Raxil @ 1g /kg seed to prevent crop from Flag/loose smut disease. Cost: Rs. 200/ha	Row spacing:22.5 cm	after harvest will take care Creation of soil mulch during weedin	sowing and 40 kg N /ha about 30-60 DAS with winter rain Total Cost: Rs. 2000/ha Half dose of NPK in light soils Cost: Rs.1150 /ha	after sowing (Rs. 2200/ha) Or Spray 2,4-D @ 875g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.450/h**	(chlorpyriphos) 20 EC @ 4 ml /kg seed **Aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox 25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PBW 175	be given	B:C=1.12-2.16 without supplemental irrigation

Source of seed

Varities	
PBW 175 PBW 527	**Ludhiana, PAU**

Early withdrawal of monsoon (36 and 37 SMW)

Wheat after maize

Situation	Varities	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other**	**Expected yield (Kg/ha)**
Early withdrawal of monsoon (36 and 37 SMW) (Sowing time: 4th week of Oct)	PBW 175	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing. in 43 and 44 SMW . Cost: Rs. 3000 to 4000/ha	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Bavistan/Deroal/ Agrozim @ 2.5 g /kg seed or Raxil @ 1g /kg seed to prevent crop from Flag/loose smut disease. Cost: Rs. 200/ha	100 Cost: Rs.1750/ha Row spacing:25 to 30 cm row spacing	Ploughing (2) & planking of fields immediate after harvest will take care Creation of soil mulch during weedin	Drilled NPK:40+ 40+30 kg/ha at sowing and 40 kg N /ha about 30-60 DAS with winter rain Total Cost: Rs. 2000/ha Half dose of NPK in light soils Cost: Rs.1150 /ha	One hoeing with kurpa 4-6 weeks after sowing (Rs. 2200/ha) Or Spray 2,4-D @ 875g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.450/h**	**Termite:** Treat the seed before sowing with Dursban (chlorpyriphos) 20 EC @ 4 ml /kg seed **Aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox 25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PBW 175	One presowing irrigation ,if available, to be given Sow at 8-10 cm depth with modified tractor drawn seed drill attached with furrow openers	GY: 15-20 B:C=1.56-2.63 GY:12-15 B:C=1.31-2.16 without presowing irrigation
Early withdrawal of monsoon (36 and 37 SMW) water stress at reproductive stage (3 and 4	PBW 175	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing. in 43 and 44	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Bavistan/Deroal/ Agrozim @ 2.5 g /kg seed or Raxil @ 1g /kg seed to prevent crop from	100 Cost: Rs.1750/ha Row spacing:25 to 30 cm row spacing	Ploughing (2) & planking of fields immediate after harvest will take care Creation of soil mulch during weedin	Drilled NPK:40+ 40+30 kg/ha at sowing and 40 kg N /ha about 30-60 DAS with winter rain	One hoeing with kurpa 4-6 weeks after sowing (Rs. 2200/ha) Or	**Termite:** Treat the seed before sowing with Dursban (chlorpyriphos) 20 EC @ 4 ml /kg seed **Aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox	One presowing irrigation + one supplemental irrigation at reproductive stage , if available, to be given	GY: 15-20 B:C=1.50-2.52 GY:12-15 B:C=1.26-2.06 without pre-sowing but with irrigation at reproductive stage)

SMW)(Sowing time: 4th week of Oct)		SMW . Cost: Rs. 3000 to 4000/ha	Flag/loose smut disease. Cost: Rs. 200/ha			Total Cost: Rs. 2000/ha Half dose of NPK in light soils Cost: Rs.1150 /ha	Spray 2,4-D @ 875g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.450/h**	25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PBW 175	Sow at 8-10 cm depth with modified tractor drawn seed drill attached with furrow openers	GY:5-10 B:C=-0.62-1.60 (without pre-sowing & supplemental irrigations)

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal-Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0

Normal withdrawl of monsoon: second Fortnight of September (38 and 39 SMW) and normal *rabi* (II fortnight of October) (42 and 43 SMW)

Crop: Barley after maize

Situation	Variety	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (Kg/ha)
Normal withdrawal of monsoon and normal *rabi* (Sowing time: 15 to 30 October)	PL 419 duration 130 days	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing with bullock drawn *pora* in 43 and 44 SMW . Cost: Rs. 3000 4000 /ha	Vitavax and thiram each @ 3g /kg seed to prevent crop from stripe disease, loose smut and covered smut disease. Cost:Rs.100	112.5 Rs.1700/ha Row spacing:20 cm	Ploughing (2) & planking (2) of fields immediate after harvest of *kharif* crops for moisture conservation Creation of soil mulch during weeding	Drilled NPK:40+30+15 kg/ha at sowing rain Cost: Rs.1150/ha	One hoeing with kurpa 4-6 weeks after sowing (Rs. 2200/ha) Or Spray 2,4-D @ 625g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.400/ha**	**Corn leaf aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox 25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PL 419	--	GY: 25-30 B:C=2.20-3.14

Normal withdrawal of monsoon and normal *rabi* but moisture deficit during reproductive growth stage (52 and 1 SMW) (Sowing time: 15 to 30 October)	PL 419 duration 130 days	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing with bullock drawn *pora* in 43 and 44 SMW . Cost: Rs. 3000 4000 /ha	Vitavax and thiram each @ 3g /kg seed to prevent crop from stripe disease, loose smut and covered smut disease. Cost:Rs.100	112.5 Rs.1700/ha Row spacing:20 cm	Ploughing (2) & planking (2) of fields immediate after harvest of *kharif* crops for moisture conservation Creation of soil mulch during weeding	Drilled NPK:40+30+15 kg/ha at sowing rain Cost: Rs.1150/ha	One hoeing with kurpa 4-6 weeks after sowing (Rs. 2200/ha) Or Spray 2,4-D @ 625g/ha in 500 L of water 40-45 DAS in sole wheat crop **Rs.400/ha**	**Corn leaf aphid**: Spray Rogor 30 EC (Dimethoate) @ or Metasystox 25 EC 375 ml /ha in 200-250 L water **Yellow rust:** Grow resistant variety PL 419	Give one supplemental irrigation,if available Otherwise harvest for fodder and continue for ratoon	GY: 25-30 B:C=2.12-3.01 GY:10- 15 B:C=1.02-1.90 If supplemental irrigation is not given

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri ACZ: Hot dry/moist sub humid AESR: 9.1 Soil Type: Inceptisoles
Annual Average Normal Rainfall: 1120(mm):1129
Normal date of onset of monsoon: 1 July (27 & 28 SMW) Crop/ Cropping System: Greengram

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed management	Pest and disease management	Any other/ Remarks	Expected yield (q/ha)
Normal onset & no stress (27 & 28 SMW) (Sowing Time: 1st fortnight of July)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Cost: Rs. 1200/ha Spacing R-R: 30 cm P-P: 10 cm	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-	Blister beetle is a serious problem in recent years & has no recommendation for its control so far.	GY: 11.0-12.0 B:C=2.40-2.67 GY may reduce upto 30-50% due to blister beetle

								78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.		
Normal onset & early stress (15-20 DAS, 29 &30 SMW) (Sowing Time: 1st fortnight of July)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	Blister beetle is a serious problem in recent years at flowering stage & has no recommendation for its control so far.	GY: 10.0-12.0 B:C=2.22-2.67 GY may reduce upto 30-50% due to blister beetle
Normal onset & mid	PAU 911, ML 818	Summer ploughing one in May with a	Seed inoculation with Captan	20.0 Spacin	Sowing across the slopes	N: 12.5 kg/ha	First hoeing after 4 weeks of sowing	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml	Blister beetle is a serious	GY: 6.0-8.0 B:C=1.38

season stress (35-40 DAS, 32 & 33 SMW) (Sowing Time: 1st fortnight of July)	(75-80 days duration)	rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	g R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Compartmenta-lization of field	P_2O_5: 40 kg/ha Cost: Rs.1650/ha	Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	problem at flowering stage in recent years & has no recommendation for its control so far. Thinning of alternate plants in a row or life saving irrigation, if available can be given Cost:Rs. 500	-1.88 GY: 10.0-12.0 B:C=2.14 -2.57 (with life saving irrigation) GY may reduce upto 30-50% due to blister beetle
Normal onset & terminal stress (55-60 DAS, 35 & 36 SMW) (Sowing	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost:	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar,**	Blister beetle is a serious problem at flowering stage in recent years & has no recommend	GY: 9.0-10.0 B:C=2.02 -2.21 GY may reduce upto 30-50% due to blister

Time: 1st fortnight of July)		Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm two ploughings at 27 & 28 SMW followed by one planking with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Cost: Rs.150/ha	Rs. 1200/ha			traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	ation for its control so far.	beetle

Delayed onset of monsoon: 15-30 July (29 to 30 SMW) Crop: Greengram

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress (29 & 30 SMW) (Sowing Time: 2nd fortnight of July)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm two ploughings at 29 & 30 SMW followed by one planking with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha	Blister beetle is a serious problem in recent years & has no recommendation for its control so far.	GY: 11.0-12.0 B:C=2.40-2.67 GY may reduce upto 40-70% due to blister beetle

								for CLS. Grow disease resistant varieties.		
Delayed onset and early stress (15-20 DAS, 31 &32 SMW) (Sowing Time: 2nd fortnight of July)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm two ploughings at 29 & 30 SMW followed by one planking with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant	Blister beetle is a serious problem in recent years & has no recommendation for its control so far.	GY 10.0-12.0 B:C=2.22-2.67 GY may reduce upto 40-70% due to blister beetle

								varieties.		
Delayed onset and onset & mid season stress (35-40 DAS, 34 & 35 SMW) (Sowing Time: 2nd fortnight of July)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	Blister beetle is a serious problem in recent years & has no recommendation for its control so far. Thinning of alternate plants or life saving irrigation, if available can be given	GY: 6.0-8.0 B:C=1.38-1.88 GY: 10.0-12.0 B:C=2.14-2.57 with life saving irrigation) GY may reduce upto 40-70% due to blister beetle
Delayed onset &	PAU 911,	Summer ploughing one	Seed inoculation	20.0	Sowing across the slopes	N: 12.5 kg/ha	First hoeing after 4 weeks	**Jassid, Aphid, Whitefly &**	Blister beetle is a serious	GY: 9.0-10.0

terminal stress (55-60 DAS, 37 & 38 SMW) (Sowing Time: 2nd fortnight of July)	ML 818 (75-80 days duration)	in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Compartmenta-lization of field	P_2O_5: 40 kg/ha Cost: Rs.1650/ha	of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	problem in recent years & has no recommendation for its control so far.	B:C=2.02-2.31 GY may reduce upto 40-70% due to blister beetle

Delayed onset of monsoon by 30 days (31 SMW) Crop: Greengram

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed management	Pest and disease management	Any other/ Remarks	Expected yield (q/ha)
Delayed onset of monsoon by 30 days & no stress (31 SMW) (Sowing Time: 1st week of August)	PAU 911	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (1) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera (31 SMW) Cost: Rs.2000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant	Blister beetle is a serious problem at flowering stage in recent years & has no recommendation for its control so far.	GY: 7.0-10.0 B:C=1.62-2.31 GY may reduce upto 20-40% due to blister beetle

								varieties.		
Delayed onset of monsoon by 30 days & early stress (10-15 DAS, 33 SMW) (Sowing Time: 1st week of August)	PAU 911, (75 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (1) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera (31 SMW) Cost: Rs.2000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	Blister beetle is a serious problem at flowering stage in recent years & has no recommendation for its control so far.	GY: 7.0-8.0 B:C=1.62-1.88 GY may reduce upto 40-70% due to blister beetle
Delayed onset of monsoon by 30 days &	PAU 911, ML 818 (75-80	Summer ploughing one in May with a rainfall of 20 mm	Seed inoculation with Captan or Thiram @ 3 g/kg seed	20.0 Spacing R-R: 30 cm	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha	First hoeing after 4 weeks of sowing Cost:	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or	Blister beetle is a serious problem in recent years	GY: 4.0-6.0 B:C=0.96-1.47

mid season stress (30-35 DAS, 36 SMW) (Sowing Time: 1st week of August)	days duration)	(18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (1) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera (31 SMW) Cost: Rs.2000/ha	and then with recommended Rhizobium culture Cost: Rs.150/ha	P-P: 10 cm Cost: Rs. 1200/ha		Cost: Rs.1650/ha	Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC (trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	& has no recommendation for its control so far. Thinning of alternate plants or life saving irrigation, if available Or Crop can be incorporated in fields for green manure & Toria can be sown	GY: 7.0-9.0 B:C=1.56-2.02 (with life saving irrigation) GY may reduce upto 40-70% due to blister beetle
Delayed onset of monsoon by 30 days & terminal stress (50-55 DAS, 38 SMW)	PAU 911, ML 818 (75-80 days duration)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost:	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 40 kg/ha Cost: Rs.1650/ha	First hoeing after 4 weeks of sowing Cost: Rs.2000/ha or Pre-plant incorporation of 2.0 l/ha of traflin 48 EC	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar,**	Blister beetle is a serious problem in recent years & has no recommendation for its control so far.	GY: 6.0-8.0 B:C=1.41-1.88 GY may reduce upto 40-70% due to blister beetle

(Sowing Time: 1st week of August)		bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (1) at 31 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera (31 SMW) Cost: Rs.2000/ha	Rs.150/ha				(trifluralin) or 2.5 l/ha stomp (pendimethalin) within two days of sowing.	**semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.		

Source of seed

Composites/Hybrids:	
PAU 911, ML 818	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri ACZ: Hot dry/moist sub humid AESR: 9.1 Soil Type: Inceptisoles
Annual Average Normal Rainfall :1120(mm):1129
Normal date of onset of monsoon: 1 July (27 & 28 SMW) Crop/ Cropping System: Blackgram

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed management	Pest and disease management	Any other/ Remarks	Expected yield (q/ha)
Normal onset & no stress (27 & 28 SMW) (Sowing Time: 1st fortnight of July)	Mash 114, Mash 338	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78)	-	GY: 7.0-9.0 B:C=1.70-2.36 GY may reduce upto 10% due to blister beetle

								@ 1.0 kg/ha for CLS. Grow disease resistant varieties.		
Normal onset & early stress (15-20 DAS, 29 &30 SMW) (Sowing Time: 1st fortnight of July)	Mash 114, Mash 338	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	-	GY: 6.0-8.0 B:C=1.27-2.14 GY may reduce upto 10% due to blister beetle
Normal onset & mid season stress	Mash 114, Mash 338	Summer ploughing one in May with a rainfall of 20 mm	Seed inoculation with Captan or Thiram @ 3 g/kg seed	20.0 Spacing R-R: 30 cm	Sowing across the slopes Compartme	N: 12.5 kg/ha P_2O_5: 25 kg/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or	Thinning of alternate plants in a row or life	GY: 5.0-7.0 B:C=1.08-1.92 GY: 7.0-

(35-40 DAS, 32 & 33 SMW) (Sowing Time: 1st fortnight of July)		(18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	and then with recommended Rhizobium culture Cost: Rs.150/ha	P-P: 10 cm Cost: Rs. 1200/ha	nta-lization of field	(150 kg SSP) Cost: Rs. 1100/ha	or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	saving irrigation, if available	9.0 B:C=1.50-1.93 (with life saving irrigation) GY may reduce upto 10% due to blister beetle
Normal onset & terminal stress (55-60 DAS, 35 & 36 SMW) (Sowing Time: 1st fortnight of July)	Mash 114, Mash 338	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha.	-	GY: 6.0-8.0 B:C=1.27-2.14 GY may reduce upto 10% due to blister beetle

		when soil is moist up to 30 cm ploughing (2) at 27 & 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha					1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.		

Delayed onset of monsoon: 15-30 July (29 to 30 SMW) Crop: Blackgram

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress (29 & 30 SMW) (Sowing Time: 2nd fortnight of July)	Mash 114, Mash 338 (83	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	-	GY: 7.0-9.0 B:C=1.70-2.36 GY may reduce upto 10% due to blister beetle
Delayed onset and early stress (15-20 DAS, 31	Mash 114, Mash 338 (83 to 90 days	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW)	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with	20.0 Spacing R-R: 30 cm P-P: 10	Sowing across the slopes Compartmenta-lization of	N: 12.5 kg/ha P_2O_5: 25 kg/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton	-	GY: 6.0-8.0 B:C=1.27-2.14 GY may

&32 SMW) (Sowing Time: 2nd fortnight of July)	duration	Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	recommended Rhizobium culture Cost: Rs.150/ha	cm Cost: Rs. 1200/ha	field	(150 kg SSP) Cost: Rs. 1100/ha	2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.		reduce upto 10% due to blister beetle
Delayed onset and onset & mid season stress (40-75 DAS, 35 & 36 SMW) (Sowing Time: 2nd fortnight of July)	Mash 114, Mash 338 83 to 90 days duration	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of	Thinning of alternate plants in arow or life saving irrigation, if available	GY: 5.0-7.0 B:C=1.08-1.92 GY: 7.0-9.0 B:C=1.50-1.93 (with life saving irrigation) GY may reduce upto 10% due to blister beetle

		cultivator and sowing with kera Cost: Rs.3000/ha					DAS	Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.		
Delayed onset and onset & terminal stress (65-75 DAS, 38 & 39 SMW) (Sowing Time: 2nd fortnight of July)	Mash 114, Mash 338 83 to 90 days duration	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 & 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	Seed inoculation with Captan or Thiram @ 3 g/kg seed and then with recommended Rhizobium culture Cost: Rs.150/ha	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	-No measures can be suggested in this situation	GY: 6.0-8.0 B:C=1.27-2.14 GY may reduce upto 10% due to blister beetle

Delayed onset of monsoon by 30 days (31 SMW) Crop: Blackgram

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress (31 SMW)/early stress (33-34 SMW), mid season stress (36-37 SMW)/terminal stress (40-41 SMW) (Sowing Time: 1st week of August)	Mash 114, Mash 338	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) broadcast the seed and plough the field one time followed by planking (31 SMW) Cost: Rs.1150/ha	-	20.0 Spacing R-R: 30 cm P-P: 10 cm Cost: Rs. 1200/ha	Sowing across the slopes Compartmenta-lization of field	N: 12.5 kg/ha P_2O_5: 25 kg/ha (150 kg SSP) Cost: Rs. 1100/ha	Hoeing after one month of sowing. Cost: Rs.2000/ha or 2.5 liters of stomp 30 EC (pendimethalin) per ha within two days of sowing. or 1.5 liters of stomp 30 EC per ha within two days of sowing followed by hoeing at 25 DAS	**Jassid, Aphid, Whitefly & Flea-beetle**: 625 ml Rogor 30 EC (dimethoate) or 625 ml Metasystox 25 EC (oxydemeton methyl) per ha. **Hairy caterpillar, semi-looper**: 1.25 litre Thiodan 35 EC (endosulfan) per ha. **Tobacco caterpillar**: 2.0 kg acephate 75 SP or 5.0 liters chlorpyriphos 20 EC per ha. **Yellow mosaic virus**: control the white fly. **Cercospora leaf spot, Root rot**: seed treatment with 3 g of Captan or Thiram/kg seed. Spray Zineb 75 WP (dithane Z-78) @ 1.0 kg/ha for CLS. Grow disease resistant varieties.	Incorporate the crop 45-50 DAS if there is mid season stress	GY: 4.0-6.0 B:C=1.02-1.96 (no stress/early stress). GY: 3.0-5.0 B:C=0.78-1.67 (mid season/terminal stress) Incorporate the cop as Green manure(mid season stress) for benefit of *rabi* crops

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri ACZ: Hot dry/moist sub humid AESR: 9.1 Soil Type: Inceptisoles

Annual Average Normal Rainfall: 1120(mm):1129
Delayed onset of monsoon by 30 days (31 SMW) Crop/ Cropping System: Cluster bean (Fodder)

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Delayed onset and No stress (31 SMW)/early stress (33-34 SMW), mid season stress (36-37 SMW)/terminal stress (SMW) (Sowing Time: 1st week of August)	Guara 80 duration	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) broadcast the seed and plough the field one time followed by planking (31 SMW) Cost: Rs.1150/ha	-	45.0-50.0 Cost: Rs. 1800-2000 /ha	Sowing across the slopes Compartmenta-lization of field	N: 22.5 kg/ha P_2O_5: 60 kg/ha (375 kg SSP) Cost: Rs. 2400/ha	-	-	-	Fodder yield: 25.0 -30.0 t/ha B:C=0.84-1.01 (No / Early stress) Fodder yield: 20.0 -25.0 t/ha B:C=0.69-0.86 (Mid / Terminal stress)

Variety	
Guara 80	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri ACZ: Hot dry/moist sub humid AESR: 9.1 Soil Type: Inceptisoles

Annual Average Normal Rainfall: 1120(mm):1129

Delayed onset of monsoon by 30 days (31 SMW) Crop/ Cropping System: Cowpea (Fodder)

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed management	Pest and disease management	Any other/ Remarks	Expected yield (q/ha)
Delayed onset and No stress (31 SMW)/early stress (33-34 SMW), mid season stress (36-37 SMW)/terminal stress (SMW) (Sowing Time: 1st week of August)	Cowpea 88, CL 367	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) broadcast the seed and plough the field one time followed by planking (31 SMW) Cost: Rs.1150/ha	-	cowpea 88: 50.0-62.5 & CL 367: 30.0 Cost: Rs. 900-1875/ha	Sowing across the slopes Compartmentalization of field	N: 18.75 kg/ha P_2O_5: 55 kg/ha (344 kg SSP) Cost: Rs. 2200/ha	-	-		Fodder yield: 20.0 -25.0 t/ha B:C=0.71-0.86 (No / Early stress) Fodder yield: 18.0 -20.0 t/ha B:C=0.66-0.74 (Mid / Terminal stress)

Composites/Hybrids:	
Cowpea 88, CL 367	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles **Annual Normal Rainfall (mm):**1129.0

Normal onset of monsoon(1st July) and Early withdrawal of monsoon (36 and 37 SMW), Normal withdrawal of monsoon (38 and 39 SMW) and Late withdrawal of monsoon (40 and 41 SMW) **Crop/ Cropping System: Chickpea** :

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Normal onset of monsoon (1st July) and Early withdrawl of monsoon (36 and 37 SMW) (Sowing Time: 1st fortnight of October)	PBG 1 PBG 5 C 235 (160-165 days duration)	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing. in 40 and 41 SMW . Cost: Rs. 3000 /ha	Endosulfan 35 EC or chlorpyrifos 20 EC @ 10 ml/kg seed followed by Bavistin (1.5+1.5 g) @ 3.0 g or hexacap or captan or captaf @ 3.0 g per kg seed and lastly with recommended Rhizobium culture Cost:Rs.150/ha.	PBG 1 :37.5- 45.0 kg Rs.1900 to 2250/ha PBG 5 : 60.0 kg Rs.3000/ha Spacing R-R: 30 cm Depth of sowing 10-12.5 cm	Two hoeing at 30 (44 and 45SMW) and 60 days after sowing (49 and 50 SMW) (Creation of soil mulch during weeding	N: 15 kg/ha P_2O_5: 20 kg/ha Rs.1000/ha	One or two hand hoeing with kasola at 30 and 60 (48 and 49 SMW) DAS. Cost: Rs. 2000/ha for one hoeing Or if moisture is enough, go for Pre-palnt application of Treflan 48 EC (trifluralin) @ 2.5 liters/ha or pre-emergence application of Stomp 30 EC (pendimethalin) @ 2.5 liters/ha.	**Gram caterpillar:** Spray 2.5 liters of Thiodan 35 EC (endosulfan) or 250 ml Sumicidin/Fenlik/Agrofen 20 EC (fenvalerate) or 400 ml Decis 2.8 EC (deltamethrin) or 200 ml Cymbush 25 EC (cypermethrin) or dust 25.0 kg Malathion 5% dust (malathion) per ha at the start of pod formation and repeat after 2 weeks, if necessary. **Blight:** Give 3-5 sprays of Hexacap or Indofil M-45 or Captan or Captaf or Kavach @ 900 g/ha at 15 days interval 250 liters of water. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or baytan 200 g or Bayleton @ 200 g or	Give one irrigation if available if there is frost for 48 hrs during Second fortnight of December to first fortnight of January (51 to 2 SMW) Cost:Rs 500	SY: PBG 1: 8.0-10 PBG 5: 8.0-10 B:C=1.47 -2.33 Yield reduction can be upto 50% depending on the severity of frost

								Thiram 900 g in 250-300 liters of water per ha. **Wilt, Stem rot & Foot rot:** Grow disease resistant varieties		
Normal onset of monsoon (1st July) and Norma l withdrawl of monsoon (38 and 39 SMW) (Sowing Time: Entire October	PBG 1 PBG 5 C235 (160-165 days duration)	Two ploughings (38 and 39 SMW) & planking immediatel y after harvest of maize and sowing. in 40 to 43 SMW . Cost: Rs. 3000 /ha	Endosulfan 35 EC or chlorpyrifos 20 EC @ 10 ml/kg seed followed by Bavistin (1.5+1.5 g) @ 3.0 g or hexacap or captan or captaf @ 3.0 g per kg seed and lastly with recommended Rhizobium culture Cost:Rs.150/h a.	PBG 1 :37.5- 45.0 kg Rs.1900 to 2250/ha PBG 5 : 60.0 kg Rs.3000/h a Spacing R-R: 30 cm Depth of sowing 10-12.5 cm	Two hoeing at during 44 to 47 SMW depending upon DOS and 60 days after sowing (49 to 52 SMW) (Creation of soil mulch during weeding	N: 15 kg/ha P_2O_5: 20 kg/ha Rs.1000/h a	One or two hand hoeing with kasola at 30 and 60 (48 and 49 SMW) DAS. Cost: Rs. 2000/ha for one hoeing Or if moisture is enough, go for Pre-palnt application of Treflan 48 EC (trifluralin) @ 2.5 liters/ha or pre-emergence application of Stomp 30 EC (pendimethali n) @ 2.5 liters/ha.	**Gram caterpillar:** Spray 2.5 liters of Thiodan 35 EC (endosulfan) or 250 ml Sumicidin/Fenlik/Agrof en 20 EC (fenvalerate) or 400 ml Decis 2.8 EC (deltamethrin) or 200 ml Cymbush 25 EC (cypermethrin) or dust 25.0 kg Malathion 5% dust (malathion) per ha at the start of pod formation and repeat after 2 weeks, if necessary. **Blight:** Give 3-5 sprays of Hexacap or Indofil M-45 or Captan or Captaf or Kavach @ 900 g/ha at 15 days interval 250 liters of water. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or baytan 200 g or Bayleton @ 200 g or Thiram 900 g in 250-300 liters of water per ha. **Wilt, Stem rot & Foot rot:** Grow disease resistant varieties	Give one irrigation if available if there is frost for 48 hrs during Second fortnight of December to first fortnight of January (51 to 2 SMW) Cost:Rs.50 0	SY: PBG 1:10.0-11.0 PBG 5: 10.0-11.0 B:C=1.80 -2.51 Yield reduction can be upto 50% dependin g on the severity of frost
Normal onset of	PBG 1, PBG 5 &	Two ploughings	Endosulfan 35 EC or	PBG 1 :37.5- 45.0	Two hoeing at during 44	N: 15 kg/ha	One or two hand hoeing	**Gram caterpillar:** Spray 2.5 liters of	Give one irrigation if	SY:

monsoon (1st July) and Late withdrawl of monsoon (40 and 41 SMW) (Sowing Time: 1st fortnight of November)	C 235(160 -165 days duration)	(38 and 39 SMW) & planking immediatel y after harvest of maize and sowing. in 42 to 43 SMW . Cost: Rs. 3000 /ha	chlorpyrifos 20 EC @ 10 ml/kg seed followed by Bavistin (1.5+1.5 g) @ 3.0 g or hexacap or captan or captaf @ 3.0 g per kg seed and lastly with recommended Rhizobium culture Cost:Rs.150/h a.	kg Rs.1900 to 2250/ha PBG 5 : 60.0 kg Rs.3000/h a Spacing R-R: 30 cm Depth of sowing 10-12.5 cm	to 47 SMW depending upon DOS and 60 days after sowing (49 to 52 SMW) (Creation of soil mulch during weeding	P_2O_5: 20 kg/ha Rs.1000/h a	with kasola at 30 and 60 (48 and 49 SMW) DAS. Cost: Rs. 2000/ha for one hoeing Or if moisture is enough, go for Pre-palnt application of Treflan 48 EC (trifluralin) @ 2.5 liters/ha or pre-emergence application of Stomp 30 EC (pendimethali n) @ 2.5 liters/ha. Rs……	Thiodan 35 EC (endosulfan) or 250 ml Sumicidin/Fenlik/Agrof en 20 EC (fenvalerate) or 400 ml Decis 2.8 EC (deltamethrin) or 200 ml Cymbush 25 EC (cypermethrin) or dust 25.0 kg Malathion 5% dust (malathion) per ha at the start of pod formation and repeat after 2 weeks, if necessary. **Blight:** Give 3-5 sprays of Hexacap or Indofil M-45 or Captan or Captaf or Kavach @ 900 g/ha at 15 days interval 250 liters of water. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or baytan 200 g or Bayleton @ 200 g or Thiram 900 g in 250-300 liters of water per ha. **Wilt, Stem rot & Foot rot:** Grow disease resistant varieties	available if there is frost for 48 hrs during Second fortnight of December to first fortnight of January (51 to 2 SMW) Cost:Rs.50 0	PBG 1: 10.0-12.0 PBG 5: 10.0-12.0 B:C=1.80 -2.68

Varieties	
PBG 1,PBG 5 & C 235	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Normal onset of monsoon(1st July) and Early withdrawal of monsoon (36 and 37 SMW), Normal withdrawal of monsoon (38 and 39 SMW) and Late withdrawal of monsoon (40 and 41 SMW)
Crop/ Cropping System: Lentil: LL 699 & LL 147 (145-150 days duration)

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed management**	**Pest and disease management**	**Any other/ Remarks**	**Expected yield (q/ha)**
Normal onset of monsoon (1st July) and Early withdrawl of monsoon (36 and 37 SMW) (Sowing Time: 1st fortnight of October)	LL 699 & LL 147 (145-150 days duration)	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing. in 40 and 41 SMW . Cost: Rs. 3000 /ha	Captan @ 2.0 g per kg seed. Seed inoculation with recommended Rhizobium culture Cost: Rs.150/ha	**35** **Cost: Rs.1750/ha** Spacing R-R: 22.5 cm	Two hoeing at 30 (44 and 45SMW) and 60 days after sowing (49 and 50 SMW) (Creation of soil mulch during weeding Cost: Rs. 2000/ha for one hoeing	N: 12.5 kg/ha P_2O_5: 20 kg/ha (P_2O_5: 40 kg/ha if seed is not inoculated with Rhizobium **Cost:Rs.950/ha**	One or two hand hoeing with kasola at 30 and 60 (48 and 49 SMW) DAS.	**Lentil pod borer:** Spray 2.25 kg of Sevin/Hexavin 50 WP in 80 liters of water per ha at flower initiation. Repeat after 3 weeks, if necessary **Blight:** Seed treatment as mentioned earlierr. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or Thiram 900 g in 250-300 liters of water per ha. **Rust:** Grow tolerant varieties	Give one supplementai irrigation ifavailable	SY: 6.0-8.0 B:C=1.79-2.33
Normal onset of monsoon (1st July) and Normal withdrawl of	LL 699 & LL 147 (145-150 days duration)	Two ploughings (38 and 39 SMW) & planking immediately after	Captan @ 2.0 g per kg seed. Seed inoculation with recommen	**35** **Cost: Rs.1750/ha**	Two hoeing at 30 (44 and 45SMW) and 60 days after sowing (49	N: 12.5 kg/ha P_2O_5: 20 kg/ha (P_2O_5: 40 kg/ha if seed is not inoculated with Rhizobium	One or two hand hoeing with kasola at 30 and 60 (48 and 49	**Lentil pod borer:** Spray 2.25 kg of Sevin/Hexavin 50 WP in 80 liters of water per ha at flower initiation. Repeat after 3 weeks, if necessary	Give one supplementai irrigation ifavailable	SY: 8.0-9.0 B:C=2.33-2.57

monsoon (38 and 39 SMW) (Sowing Time: Entire October		harvest of maize and sowing. in 40 to 43 SMW . Cost: Rs. 3000 /ha	ded Rhizobium culture Cost: Rs.150/ha	Spacing R-R: 22.5 cm	and 50 SMW) (Creation of soil mulch during weeding Cost: Rs. 2000/ha for one hoeing	**Cost:Rs.950/ha**	SMW) DAS.	**Blight:** Seed treatment as mentioned earlierr. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or Thiram 900 g in 250-300 liters of water per ha. **Rust:** Grow tolerant varieties		
Normal onset of monsoon (1st July) and Late withdrawl of monsoon (40 and 41 SMW) (Sowing Time: 1st fortnight of November)		Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing. in 42 to 43 SMW . Cost: Rs. 3000 /ha	Captan @ 2.0 g per kg seed. Seed inoculation with recommended Rhizobium culture Cost: Rs.150/ha	**35** **Cost: Rs.1750/ha** Spacing R-R: 22.5 cm	Two hoeing at during 44 to 47 SMW depending upon DOS and 60 days after sowing (49 to 52 SMW) (Creation of soil mulch during weeding Cost: Rs. 2000/ha for one hoeing	N: 12.5 kg/ha P_2O_5: 20 kg/ha (P_2O_5: 40 kg/ha if seed is not inoculated with Rhizobium **Cost:Rs.950/ha**	One or two hand hoeing with kasola at 30 and 60 (48 and 49SMW) DAS.	**Lentil pod borer:** Spray 2.25 kg of Sevin/Hexavin 50 WP in 80 liters of water per ha at flower initiation. Repeat after 3 weeks, if necessary **Blight:** Seed treatment as mentioned earlierr. **Grey mould:** One spray of Indofil M-45 @ 900 g or thiabendazole @ 200 g or Thiram 900 g in 250-300 liters of water per ha. **Rust:** Grow tolerant varieties	Give one supplementai irrigation If available	SY: 8.0-10.0 B:C=2.33-2.80

Varities	
LL 699 & LL 147	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles

Annual Normal Rainfall (mm):1129
Normal date of onset of monsoon: 1 July (27 SMW) **Crop:** Groundnut

Situation		Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other/Remarks**	**Expected yield (q/ha)**
Normal onset and No stress (Sowing : 20 June- 7 July)	SG-99, SG-84 (bunch type) M548(Spreading) (123 days duration	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 26 and 27 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera with premonsoon showers Cost: Rs.3000/ha	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Indofil M-45 @3 gm / kg seed Cost: Rs. 275/ha	SG-99: 100 kg healthy kernels Cost: Rs.6000 SG-84: 95 kg healthy kernels Cost: Rs.5700 Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of fields	N:15 kg/ha $P_2 0_5$:20 kg/ha Cost: Rs.1000/ha Gypsum: 125 kg/ha (govt.supply)	Two hoeing at : 3 and 6 weeks after sowing Cost: Rs. 2000-4000	**Aphid**: Spray Rogor 30 EC (Dimethoate) @ 375 ml /ha in 200 L water **Seed rot/collar rot/Tikka disease**: Seed treatment. Spray Sultaf @1250-1875 gm/ha in 500-750 L water	Crop is preferred in sandy soil overlying with loamy subsoil in lower *kandi*	GY: 17-18 B:C=2.61-3.22
Normal onset and Early stress in first fortnight of July (28 and 29 SMW) Sowing : 20 June- 7 July)	SG-99, SG-84 (bunch type) M548(Spreading)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50	Dursban (chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Indofil M-45 @3 gm / kg seed	SG-99: 100 kg healthy kernels Cost: Rs.6000 SG-84:	Sowing across the slopes Compartmentalization of fields	N:15 kg/ha $P_2 0_5$:20 kg/ha Cost: Rs.1000/ha Gypsum:	Two hoeing at : 3 and 6 weeks after sowing	**Aphid**: Spray Rogor 30 EC (Dimethoate) @ 375 ml /ha in 200 L water	Crop is preferred in sandy soil overlying with loamy subsoil in lower *Kandi*	GY: 17-18 B:C=2.61-3.22

		mm) and when soil is moist up to 30 cm ploughing (2) at 26 and 27 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera with premonsoon showers Cost: Rs.3000/ha	Cost: Rs. 275/ha	95 kg healthy kernels Cost: Rs.5700 Row: 30 cm Plant: 15 cm		125 kg/ha (govt.supply)	Cost: Rs. 2000	**Seed rot/collar rot/Tikka disease**: Seed treatment. Spray Sultaf @1250-1875 gm/ha in 500-750 L water		
Normal onset and Mid season stress at 60-65 (flowering/pegging) DAS (33 and 34 SMW) Sowing : 20 June- 7 July)	SG-99, SG-84 (bunch type) M548(Spreading)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 26 and 27 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera with premonsoon showers Cost: Rs.3000/ha	Dursban (Chlorpyriphos) 20 EC @ 12.5 ml /kg seed followed by Indofil M-45 @3 gm / kg seed Cost: Rs. 275/ha	SG-99: 100 kg healthy kernels Cost: Rs.6000 SG-84: 95 kg healthy kernels Cost: Rs.5700 Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of fields	N:15 kg/ha P_2O_5:20 kg/ha Cost: Rs.1000/ha Gypsum: 125 kg/ha (govt.supply)	Two hoeing at : 3 and 6 weeks after sowing Cost: Rs. 2000	**Aphid**: Spray Rogor 30 EC (Dimethoate) @ 375 ml /ha in 200 L water **Seed rot/collar rot/Tikka disease**: Seed treatment. Spray Sultaf @1250-1875 gm/ha in 500-750 L water	Crop is preferred in sandy soil overlying with loamy subsoil in lower *Kandi* Supplemental irrigation, if available	GY: 17-18 B:C=2.53-3.11 GY:8-10 B:C=1.23-1.79 without supplemental irrigation)
Normal onset and Terminal stress at 90 DAS (pod development) (38 and 39 SMW)	SG-99, SG-84 (bunch type) M548(Spreading)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha	Dursban (Chlorpyriphos) 20 EC @ 12.5 ml /kg seed	SG-99: 100 kg healthy kernels	Sowing across the slopes	N:15 kg/ha P_2O_5:20 kg/ha	Two hoeing at : 3 and 6 weeks	**Aphid**: Spray Rogor 30 EC (Dimethoat	Crop is preferred in sandy soil overlying with loamy	GY: 17-18 B:C=2.53-3.11

Sowing : 20 June- 7 July)		Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 26 and 27 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera with premonsoon showers Cost: Rs.3000/ha	followed by Indofil M-45 @3 gm / kg seed Cost: Rs. 275/ha	Cost: Rs.6000 SG-84: 95 kg healthy kernels Cost: Rs.5700 Row: 30 cm Plant: 15 cm	Compart menta-lization of fields	Cost: Rs.1000/ha Gypsum: 125 kg/ha (govt.supply)	after sowing Cost: Rs. 2000	e) @ 375 ml /ha in 200 L water **Seed rot/collar rot/Tikka disease**: Seed treatment. Spray Sultaf @1250-1875 gm/ha in 500-750 L water	subsoil in lower *Kandi* Supplemental irrigation, if available	GY:8-10 B:C=1.23-1.79 without supplemental irrigation)

Groundnut cannot be sown after first week of July.

Source of seed

Varieties	
SG-99, SG-84,M548	**Ludhiana, PAU**

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129
Normal date of onset of monsoon: 1 July (27 SMW)**Crop:** Sesamum

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other/ Remark	Expected yield (q/ha)
Normal onset of monsoon & no stress (Sowing time: first fortnight of July)	Pb Til No. 1 - TC 289 , RT346 (80 to 85 days)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 and 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	-	2.5 Cost: Rs.250/ha Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of field Two thinnings within 20 DAS to maintain optimum plant population Cost: Rs. 650/ha	N: 35 kg/ha Cost: Rs.500/ha	One hoeing with wheel hoe at 3 weeks after sowing (30/31 SMW) Cost: Rs.500./ha Preemergence application of Alachlor 3 litres/ha	**Leaf webber:** Decis (Deltamethrin) 2.8 EC@ 375 ml/ha in 250 L water. **Jassid**: Malathion 50 EC @1L/ha in 250 L water.at 2-3 weeks interval **Phyllody:** Avoid early sowing in June & rouge out infected plants **Blight:** 3 sprays of Bavisitin @250 gm/ha in 250 L water at 10 days interval.	A prophylactic measure for control of vectors of phyllody by spraying with Malathion	GY: 4 -5 B:C=1.62 -1.96 Likely yield reduction up to 50% in yield due to phyllody
Normal onset of monsoon & Early	Pb Til No. 1 - TC 289 , RT 346	Summer ploughing one in May with a rainfall of 20	-	2.5 Cost: Rs.250/ha	Sowing across the slopes Compartment	N: 35 kg/ha Cost:	One hoeing with wheel hoe at 3 weeks after	**Leaf webber:** Decis (Deltamethrin) 2.8 EC@ 375 ml/ha in 250 L water.	A prophylactic measure for control of	GY: 4-5 B:C=1.62 -1.96

stress at within 20 DAS (29 and 30 SMW) (Sowing time: first fortnight of July)	(80 to 85 days)	mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 and 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha		Row: 30 cm Plant: 15 cm	alization of field Two thinnings within 20 DAS to maintain optimum plant population Cost: Rs. 650/ha	Rs.500/ha	sowing (30/31 SMW) Cost: Rs.500./ha Preemergence application of Alachlor 3 litres/ha	**Jassid**: Malathion 50 EC @1L/ha in 250 L water.at 2-3 weeks interval **Phyllody:** Avoid early sowing in June & rouge out infected plants **Blight:** 3 sprays of Bavisitin @250 gm/ha in 250 L water at 10 days interval.	vectors of phyllody by spraying with Malathion	Likely yield reduction up to 50% in yield due to phyllody
Normal onset of monsoon & Midseason stress at within 40 to 45 DAS (33 and 34 SMW) (Sowing time: first fortnight of July)	Pb Til No. 1 TC 289 , RT346 (80 to 85 days)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 and 28 SMW followed	-	2.5 Cost: Rs.250/ha Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of field Two thinnings within 20 DAS to maintain optimum plant population Cost: Rs. 650/ha	N: 35 kg/ha Cost: Rs.500/ha	One hoeing with wheel hoe at 3 weeks after sowing (30/31 SMW) Cost: Rs.500./ha Preemergence application of Alachlor 3 litres/ha	**Leaf webber:** Decis (Deltamethrin) 2.8 EC@ 375 ml/ha in 250 L water. **Jassid**: Malathion 50 EC @1L/ha in 250 L water.at 2-3 weeks interval **Phyllody:** Avoid early sowing in June & rouge out infected plants **Blight:** 3 sprays of Bavisitin @250 gm/ha in 250 L water at 10 days interval.	A prophylactic measure for control of vectors of phyllody by spraying with Malathion	GY: 3-4 B:C=1.21 -1.57 Likely yield reduction up to 50% in yield due to phyllody

		by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha								
Normal onset of monsoon & Terminal stress at within 60 to 70 DAS (36 and 37 SMW) (Sowing time: first fortnight of July)	Pb Til No. 1 TC 289 , RT346 (80 to 85 days)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 27 and 28 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	-	2.5 Cost: Rs.250/ha Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of field Two thinnings within 20 DAS to maintain optimum plant population Cost: Rs. 650/ha	N: 35 kg/ha Cost: Rs.500/ha	One hoeing with wheel hoe at 3 weeks after sowing (30/31 SMW) Cost: Rs.500./ha Preemergence application of Alachlor 3 litres/ha	**Leaf webber:** Decis (Deltamethrin) 2.8 EC@ 375 ml/ha in 250 L water. **Jassid**: Malathion 50 EC @1L/ha in 250 L water.at 2-3 weeks interval **Phyllody:** Avoid early sowing in June & rouge out infected plants **Blight:** 3 sprays of Bavisitin @250 gm/ha in 250 L water at 10 days interval.	A prophylactic measure for control of vectors of phyllody by spraying with Malathion	GY: 3-4 B:C=1.21 -1.57 Likely yield reduction up to 50% in yield due to phyllody

Delayed onset of monsoon: 15 July (29 SMW) **Crop:** Sesamum

Situation	Varities	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other/Remarks	Expected yield (q/ha)
Delay onset of monsoon and no, early stress (31 and 32 SMW) //midseason stress(35 and 36SMW) /terminal stress (39 and 40 SMW) (Sowing time: 20th July)	Pb Til No. 1 TC 289 RT346 (80 to 85 days)	Summer ploughing one in May with a rainfall of 20 mm (18 SMW to 21 SMW) Cost:Rs.1000/ha Repair of field bunds. After receiving (30-50 mm) and when soil is moist up to 30 cm ploughing (2) at 29 and 30 SMW followed by planking (1) with tractor drawn disc harrow and cultivator and sowing with kera Cost: Rs.3000/ha	-	2.5 Cost: Rs.250/ha Row: 30 cm Plant: 15 cm	Sowing across the slopes Compartmentalization of field Two thinnings within 20 DAS to maintain optimum plant population Cost: Rs. 650/ha	N: 35 kg/ha Cost: Rs.500/ha	One hoeing with wheel hoe at 3 weeks after sowing (32 and 33 SMW) Cost: Rs.500./ha Preemergence application of Alachlor 3 litres/ha	**Leaf webber:** Decis (Deltamethrin) 2.8 EC@ 375 ml/ha in 250 L water. **Jassid**: Malathion 50 EC @1L/ha in 250 L water.at 2-3 weeks interval **Phyllody:** Avoid early sowing in June & rouge out infected plants **Blight:** 3 sprays of Bavisitin @250 gm/ha in 250 L water at 10 days interval.	Crop has low infestation of phylloddy	GY: 4-5 B:C=1.62-1.96 No/Early sress GY: 3-4 B:C=1.21-1.57 Midseason/Terminal stress Likely yield reduction up to 20% in yield due to phyllody

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129
Normal withdrawl of monsoon (37 and 38 SMW) and early *rabi*: September (36 to 39 SMW)
Crop : Toria (*Brassica rapa*) when the field is vacated due to failure of crop/harvest of *kharif* fodder crops

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other/Remarks	Expected yield (q/ha)
Normal withdrawal of monsoon and failure of crop/harvest of *kharif* fodder crops (Sowing time: (36 to 39 SMW)	TL 15 88 days duration	Two ploughings immediately after the vacation of field at 36 to 39 SMW followed by sowing with kera method Cost: Rs. 3000/ha	-	3.75 Cost: Rs. 250/ha **Spacing** Row: 30 cm Plant 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs500 /ha One hoeing with wheel hoe	N: 50 kg/ha P205 (SSP) : 20 kg/ha Cost: Rs.1350/ha	One hoeing with wheel hand hoe 3 weeks after sowing Cost: Rs. 500/ha	**Mustard aphid:** Spray Actara 25 WGC (thiamethoxans)@100g/ha in 200-300 L water **Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight: S**pray Blitox @625 g /ha in 250 L water	-	GY: 8-9 B:C=2.11-2.25

Toria can not be sown after 30 September (late withdrawl of monsoon since there is chance of frost damage in second fortnight of Decemeber)

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0

Normal date of onset of monsoon: 1 July Crop**:** Toria (*Brassica rapa*):TL 15 -88 days +Gobhi Sarson (*Brassica* napus)GSL-160 days duration

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal withdrawal of monsoon and failure of crop/harvest of *kharif* fodder crops (Sowing time: (36 to 39 SMW)	Toria: TL 15 Gobhi Sarson: GSL-1& GSL-2	Two ploughings immediately after the vacation of field at 36 to 39 SMW followed by sowing with kera method Cost: Rs. 3000/ha	-	2.5 kg/ha for each crop Cost: Rs. 350/ha **Spacing** In alternate rows 22.5 cm apart	Thinning of crop 3 weeks after sowing. Cost: Rs 800 /ha One hoeing with wheel hoe	N: 80 kg/ha P205: 50 kg/ha Cost: Rs 2400 /ha	One hoeing with wheel hand hoe 3 weeks after sowing Cost: Rs. 750/ha	**Mustard aphid:** Spray Actara 25 WGC (thiamethoxans)@100g/ha in 200-300 L water **Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight: S**pray Blitox @625 g /ha in 250 L water	Intercropping suitable for medium / heavy textured soils	GY: Toria: 5-7 G. Sarson: 8-9 B:C = 2.54-3.00

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall mm):1129.0

Early withdrawl of monsoon: 36 and 37 SMW

Crop: Taramira (*Eruca sativa) after harvest of Kharif crops and if soil moisture is low*

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Early/Normal withdrawal of monsoon (Sowing time: Whole October)	TMLC 2-150 days duration	Two ploughings immediately after the vacation of field at 36 to 39 SMW followed by sowing with kera method Cost: Rs. 3000/ha	-	3.75 Cost: Rs. 250/ha **Spacing** Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs 500 /ha One hoeing with wheel hoe	N: 30 kg/ha Cost: Rs. 450/ha	.One hoeing with wheel hoe Cost: Rs. 500/ha	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	Prefer deep sowing with minimum soil load on seed, under low moisture in seed zone conditions Under excess moisture conditions, brodcating of seed may be done	GY: 5-6 B:C=1.62-1.89

Late withdrawl of monsoon: 38 and 39 SMW

Crop: Taramira (Eruca sativa) after harvest of *kharif* crops

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other**	**Expected yield (q/ha)**
Late withdrawl of monsoon (38 and 39 SMW) (Sowing time: 2nd fortnight of October)	TMLC 2-150 days duration	Two ploughings (38 and 39 SMW) & planking immediately after harvest of maize and sowing with bullock drawn *pora* in 43 and 44 SMW . Cost: Rs. 3000 4000 /ha	-	3.75 Cost: Rs. 250/ha **Spacing** Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs 500 /ha One hoeing with wheel hoe	N: 30 kg/ha Cost: Rs. 450/ha	.One hoeing with wheel hoe Cost: Rs. 500/ha	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	Prefer deep sowing with minimum soil load on seed, under low moisture in seed zone conditions Under excess moisture conditions, brodcating of seed may be done	GY: 5-6 B:C=1.62-1.89

Early/Late withdrawl of monsoon **: 36 to 39 SMW**

Crop: Taramira (Eruca sativa) after harvest of *kharif* crops with very low soil moisture

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other**	**Expected yield (q/ha)**
Early/Late withdrawl of monsoon : 36 to 39 SMW with winter rains during November and upto second fortnight of December (Sowing time: 2nd fortnight of December)	TMLC 2-150 days duration	One ploughing after winter rains followed by sowing by broadcasting and planking Cost: Rs. 1500/ha	-	5.0 Cost: Rs. 400/ha	-	-	-	-	-	GY: 2-4 B:C=1.28-2.27

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Early withdrawal of monsoon: First Fortnight of September (36 and 37 SMW)
Crop: Raya (*Brassica juncea*)

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & Early withdrawal of monsoon: (36 and 37 SMW) (Sowing time: First fortnight of October)	RLM-619-143 days &; PBR-97 (136 days duration)	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 and 41 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 44 SWM) & 6 weeks (46 to 47 SWM) after sowing Cost: Rs. 2000 per hoeing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif,* prefer deep sowing.	GY:9.0-10.0 B:C=1.46-2.09

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Normal withdrawal of monsoon: second Fortnight of September (38 and 39 SMW)
Crop: Raya (*Brassica juncea*)

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other**	**Expected yield (q/ha)**
Normal onset of monsoon and & Normal withdrawal of monsoon: (38 and 39 SMW) (Sowing time: whole of October)	RLM-619-143 days &; PBR-97 (136 days duration)	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 to 43 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 46 SWM) & 6 weeks (46 to 49 SWM) after sowing Cost: Rs. 2000 per hoeing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif,* prefer deep sowing.	GY: 10.0-11.0 B:C=1.60-2.25

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Late withdrawal of monsoon: First Fortnight of October (40 and 41 SMW)
Crop: Raya (*Brassica juncea*)

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & late withdrawal of monsoon: (40 and 41 SMW) (Sowing time: second fortnight of October-first fortnight of November)	RLM-619-143 days &; PBR-97 (136 days duration)	Two ploughings (42 and 43 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (42 to 45 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (45 to 48 SWM) & 6 weeks (48 to 51 SWM) after sowing Cost: Rs. 2000 per hoeing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	Prefer deep sowing with minimum soil load on seed, under low seed zone moisture condition	GY: 9.0-10.0 B:C=1.46-2.09
Normal onset of monsoon and & late withdrawal of monsoon: (40 and 41 SMW)	RLM-619-143 days &; PBR-97 (136 days duration)	Two ploughings (42 and 43 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (46 and 47	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (49 & 50 SWM) & 6 weeks (52 & 53 SWM)	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria**	Prefer deep sowing with minimum soil load on seed, under low seed zone	GY: 6.0-7.0 B:C=1.03-1.56

Late sowing (Sowing time: second fortnight of November)		SMW) Cost: Rs. 3000 to 4000/ha					after sowing Cost: Rs. 2000 per hoeing	**blight/White rust:** **S**pray Blitox @625 g /ha in 250 L water	moisture condition	

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Early withdrawal of monsoon: First Fortnight of September (36 and 37 SMW)
Crop/ Cropping System: African Sarson (*Brassica carinata*))

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & Early withdrawal of monsoon: (36 and 37 SMW) (Sowing time: First fortnight of October)	PC-5 (168 days duration)	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 and 41 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 44 SWM) & 6 weeks (46 to 47 SWM) after sowing Cost: Rs. 2000 per hoeing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif*, prefer deep sowing.	GY: 7.0-9.0 B:C=1.18-1.92

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Normal withdrawal of monsoon: second Fortnight of September (38 and 39 SMW)
Crop/ Cropping System: African Sarson (*Brassica carinata*))

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & Normal withdrawal of monsoon: (38 and 39 SMW) (Sowing time: whole of October)	PC-5 (168 days duration)	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 to 43 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 46 SWM) & 6 weeks (46 to 49 SWM) after sowing Cost: Rs. 2000 per heoing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif*, prefer deep sowing.	GY: 8.0-10.0 B:C=1.32-2.09

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Late withdrawal of monsoon: First Fortnight of October (40 and 41 SMW)
Crop/ Cropping System: African Sarson (*Brassica carinata*))

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & late withdrawal of monsoon: (40 and 41 SMW) (Sowing time: second fortnight of October-first fortnight of December)	PC-5 (168 days duration)	Two ploughings (42 and 43 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (42 to 49 SMW) Cost: Rs. 3000 to 4000/ha	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (45 to 52 SWM) & 6 weeks (48 to 2 SWM) after sowing Cost: Rs. 2000 per heoing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	Prefer deep sowing with minimum soil load on seed, under low seed zone moisture condition	GY: 7.0-9.0 B:C=1.18-1.92
Normal onset of monsoon and & late withdrawal of monsoon: (40 and 41 SMW) **w**inter	PC-5 (168 days duration)	Two ploughings (42 and 43 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (44 to 52	-	3.75 Cost: Rs. 200/ ha Spacing Row: 30 cm Plant: 15 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2o_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (47 to 3 SWM) & 6 weeks (50 to 6 SWM)	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in	Prefer deep sowing with minimum soil load on seed, under low seed zone	GY: 6.0-6.5 B:C=1.03-1.45

rains during Novemebr and upto second fortnight of December (Sowing time: first fortnight of November to 2nd fortnight of December)		SMW) Cost: Rs. 3000 to 4000/ha					after sowing Cost: Rs. 2000 per heoing	250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	moisture condition	

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Early withdrawal of monsoon: First Fortnight of September (36 and 37 SMW)
Crop: Linseed

Situation	Varieties	Management practices								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & Early withdrawal of monsoon: (36 and 37 SMW) (Sowing time: First fortnight of October)	LC-2023	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 and 41 SMW) Cost: Rs. 3000 to 4000/ha	-	37.5 Cost: Rs. 1875/ha **Spacing** Row: 23 cm Plant:7-10 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2O_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 44 SWM) & 6 weeks (46 to 47 SWM) after sowing Cost: Rs. 2000 per heoing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif*, prefer deep sowing.	GY: 6.0-7.0 B:C=1.23-1.76

Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Normal withdrawal of monsoon: second Fortnight of September (38 and 39 SMW)
Crop: Linseed

Situation	Varieties	**Management practices**								
		Land preparation and tillage	Seed treatment	Seed rate kg/ha	In-situ/ex-situ moisture conservation	Nutrient Mgt.	Weed Mgt.	Pest and disease management	Any other	Expected yield (q/ha)
Normal onset of monsoon and & Normal withdrawal of monsoon: (38 and 39 SMW) (Sowing time: whole of October)	LC-2023	Two ploughings (40 and 41 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (40 to 43 SMW) Cost: Rs. 3000 to 4000/ha	**-**	37.5 Cost: Rs. 1875/ha **Spacing** Row: 23 cm Plant:7-10 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2O_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (43 to 46 SWM) & 6 weeks (46 to 49 SWM) after sowing Cost: Rs. 2000 per heoing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	If residual soil moisture is less due to lesser rainfall in *kharif,* prefer deep sowing.	GY: 7.0-8.0 B:C=1.41-1.97

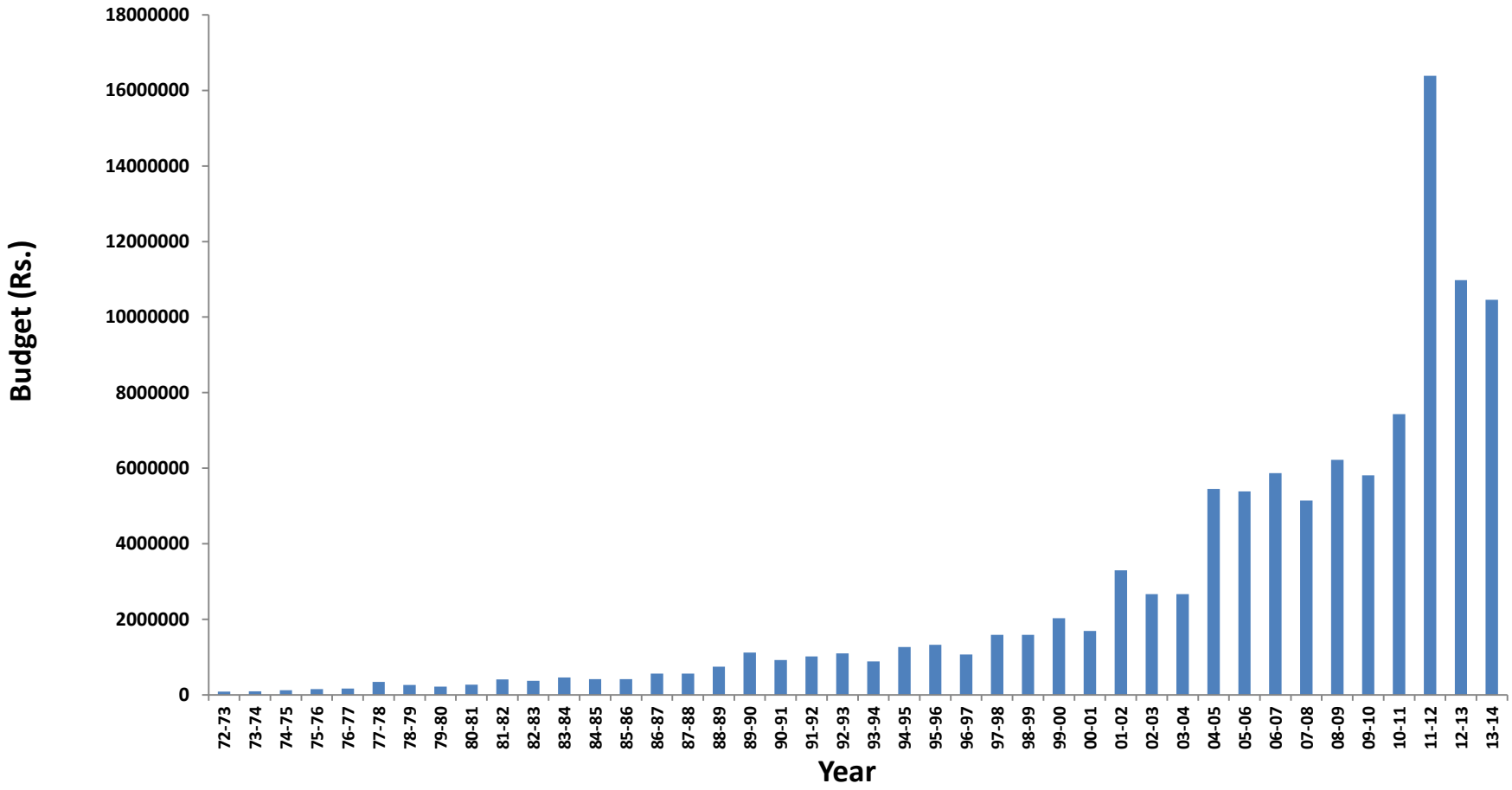
Details of contingency crop planning at AICRPDA centre for aberrant monsoon

Centre: Ballowal Saunkhri **ACZ:** Hot dry/moist sub humid **AESR:** 9.1 **Soil Type:** Inceptisoles
Annual Normal Rainfall (mm):1129.0
Late withdrawal of monsoon: First Fortnight of October (40 and 41 SMW)
Crop: Linseed

Situation	Varieties	Management practices								
		Land preparation and tillage	**Seed treatment**	**Seed rate kg/ha**	**In-situ/ex-situ moisture conservation**	**Nutrient Mgt.**	**Weed Mgt.**	**Pest and disease management**	**Any other**	**Expected yield (q/ha)**
Normal onset of monsoon and & late withdrawal of monsoon: (40 and 41 SMW) (Sowing time: second fortnight of October-first fortnight of November)	LC-2023	Two ploughings (42 and 43 SMW) & planking immediately after harvest of *kharif* crop and sowing with bullock drawn *pora* or modified tractor drawn seed drill (42 to 45 SMW) Cost: Rs. 3000 to 4000/ha	-	37.5 Cost: Rs. 1875/ha **Spacing** Row: 23 cm Plant:7-10 cm	Thinning of crop 3 weeks after sowing. Cost: Rs. 600 Hoeing for creation of soil mulch	N: 37.5 kg/ha P_2O_5: 20 kg/ha Cost: Rs. 1200/ha	Two hoeing 3 (45 to 48 SWM) & 6 weeks (48 to 51 SWM) after sowing Cost: Rs. 2000 per hoeing	**Hairy Caterpillar:** Spray Thiodan 35 EC (Endosulfan) @1200 ml/ha in 500 L water **Peach aphid**: Spray Rogor 30 EC (Dimethoate) @ 500 ml/ha in 250 L water **Alternaria blight/White rust: S**pray Blitox @625 g /ha in 250 L water	Prefer deep sowing with minimum soil load on seed, under low seed zone moisture condition	GY: 6.0-7.0 B:C=1.23-1.76

Annexures 4

Budget (Year wise allocation in bar diagram)



Annexures 5

Important Newspaper clippings

ਪੰਜਾਬ ਦੀ ਆਵਾਜ਼

ਅਜੀਤ

ਦੁਨੀਆ ਵਿਚ ਸਭ ਤੋਂ ਵੱਧ ਪੜ੍ਹਿਆ ਜਾਣ ਵਾਲਾ ਪੰਜਾਬੀ ਅਖ਼ਬਾਰ

ਪਿੰਡ ਨੈਣਵਾਂ ਵਿਖੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵੱਲੋਂ ਕਰਵਾਈ ਗਈ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਮੌਕੇ ਖੇਤੀ ਮਾਹਿਰ ਕਿਸਾਨਾਂ ਨੂੰ ਜਾਣਕਾਰੀ ਦਿੰਦੇ ਹੋਏ। ਤਸਵੀਰ- ਰਮਨ ਭਾਟੀਆ

ਨੈਣਵਾਂ 'ਚ ਕਿਸਾਨ ਗੋਸ਼ਟੀ

ਪੋਜੇਵਾਲ ਸਰਾਂ/ਚੰਦਿਆਣੀ, 15 ਮਾਰਚ (ਰਮਨ ਭਾਟੀਆ)- ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ (ਪੀ.ਏ.ਯੂ) ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਡਾ. ਐਸ. ਸੀ.ਸ਼ਰਮਾ ਦੇ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਹਾੜ੍ਹੀ ਦੀਆਂ ਫ਼ਸਲਾਂ ਦੇ ਉਤਪਾਦਨ ਤੇ ਸੁਰੱਖਿਆ, ਮਿੱਟੀ ਪਾਣੀ ਦੀ ਸੰਭਾਲ ਤੇ ਊਰਜਾ ਪ੍ਰਬੰਧ ਬਾਰੇ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਕਰਵਾਈ ਗਈ। ਡਾ. ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਸੀ.ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਤੇਲ ਬੀਜਾਂ ਦੀਆ ਫ਼ਸਲਾਂ ਸਬੰਧੀ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਉਨ੍ਹਾਂ ਕਿਸਾਨਾਂ ਨੂੰ ਦੱਸਿਆਂ ਕਿ ਪਸ਼ੂਆਂ ਦੇ ਉਜਾੜੇ ਵਾਲੀਆਂ ਥਾਵਾਂ 'ਤੇ ਤਾਰਾ ਮੀਰਾ ਲਗਾਇਆ ਜਾ ਸਕਦਾ ਹੈ । ਰਾਕੇਸ਼ ਕੁਮਾਰ ਸ਼ਰਮਾ ਅਸਿਸਟੈਂਟ ਐਨਟੋਮੋਜਿਸਟ ਨੇ ਹਾੜ੍ਹੀ ਦੀਆ ਫ਼ਸਲਾਂ ਵਿਚ ਆਉਣ ਵਾਲੀਆ ਬਿਮਾਰੀਆਂ, ਕਣਕ ਦੀ ਪੀਲੀ ਕੁੰਗੀ, ਪੇਠੇ ਦੀਆਂ ਬਿਮਾਰੀਆਂ ਸਬੰਧੀ ਕਿਸਾਨਾਂ ਨੂੰ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾ ਅਸਿਸਟੈਂਟ ਸਾਇਲ ਕੈਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਮਿੱਟੀ ਦੇ ਪ੍ਰੀਖਣ ਤੇ ਲਾਭਾਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸਹੀ ਵਰਤੋ ਸਬੰਧੀ ਜਾਗਰੂਕ ਕੀਤਾ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਸਿਫ਼ਾਰਿਸ਼ ਕੀਤੀਆਂ ਖਾਦਾਂ ਦੀ ਵਰਤੋਂ ਕਰਨ ਦੀ ਅਪੀਲ ਕੀਤੀ। ਮੁੱਖ-ਮਹਿਮਾਨ ਊਰਜਾ ਪ੍ਰਬੰਧ ਮਾਹਿਰ ਰਣਵੀਰ ਸਿੰਘ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਗੋਬਰ ਗੈਸ ਪਲਾਂਟ ਲਗਾਉਣ ਲਈ ਪ੍ਰੇਰਿਤ ਕੀਤਾ । ਡਾ. ਅਨਿਲ ਕੁਮਾਰ ਖੋਖਰ ਨੇ ਆਏ ਮਹਿਮਾਨਾਂ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ।

ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ | ਸਾਂਝਾ ਪੰਨਾ | ਸ਼ਨੀਵਾਰ, 27 ਜੁਲਾਈ 2013 | 9

ਕੰਢੀ ਖੋਜ਼ ਕੇਂਦਰ ਵਲੋਂ ਜਾਗਰੂਕਤਾ ਕੈਂਪ ਲਗਾਇਆ ਗਿਆ

ਬਲਾਚੌਰ, 26 ਜੁਲਾਈ (ਸੁਭਾਸ਼ ਜੋਸ਼ੀ)

ਡਾ: ਐਸ. ਸੀ. ਸ਼ਰਮਾ, ਨਿਰਦੇਸ਼ਕ, ਕੰਢੀ ਖੋਜ਼ ਕੇਂਦਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਦਿਸ਼ਾ-ਨਿਰਦੇਸ਼ ਅਨੁਸਾਰ ਪਿੰਡ ਨੈਣਵਾਂ ਵਿਚ ਨਿਕਰਾ ਸਕੀਮ ਦੇ ਅਧੀਨ ਇੱਕ-ਰੋਜਾ ਜਾਗਰੁਕਤਾ ਕੈਂਪ ਲਗਾਇਆ ਗਿਆ । ਇਸ ਕੈਂਪ ਵਿਚ ਕੰਢੀ ਖੋਜ਼ ਕੇਂਦਰ ਦੇ ਵਿਗਿਆਨੀਆਂ ਅਤੇ ੩੫ ਕਿਸਾਨਾਂ ਨੇ ਭਾਗ ਲਿਆ। ਕੈਂਪ ਦੇ ਦੌਰਾਨ ਕਿਸਾਨਾਂ ਨੇ ਸਾਉਣੀ ਦੀਆਂ ਫਸਲਾਂ ਵਿਚ ਆ ਰਹੀਆਂ ਸਮਸਿਆਂਵਾਂ ਬਾਰੇ ਵਿਗਿਆਨੀਆਂ ਨੂੰ ਜਾਣਕਾਰੀ ਦਿਤੀ ਜਿਨ੍ਹਾਂ ਦਾ ਨਿਪਟਾਰਾ ਮੌਕੇ ਤੇ ਹੀ ਕੀਤਾ ਗਿਆ । ਡਾ: ਵਿਵੇਕ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਸਾਇਲ ਕਮਿਸਟ ਨੇ ਪਿੰਡ ਨੈਣਵਾਂ ਵਿਚ ਚਲ ਰਹੀ ਨਿਕਰਾ ਸਕੀਮ ਦੇ ਵੱਖ-ਵੱਖ ਪਹਲੂਆਂ ਬਾਰੇ ਕਿਸਾਨਾਂ ਨੂੰ ਜਾਗਰੁਕ ਕੀਤਾ ਅਤੇ ਵਰਖਾ ਦੇ ਪਾਣੀ ਦੀ ਸਾਂਭ-ਸੰਭਾਲ ਅਤੇ ਸਹੀ ਵਰਤੋਂ ਲਈ ਪ੍ਰੇਰਿਤ ਕੀਤਾ । ਡਾ: ਰਾਕੇਸ਼ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਐਨਟਮੋਲੋਜਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਸਾਉਣੀ ਦੀਆਂ ਫਸਲਾਂ ਵਿਚ ਆ ਰਹੀਆਂ ਕੀੜੇਆਂ ਦੀਆਂ ਸਮਸਿਆਂਵਾਂ ਦੀ ਰੋਕ-ਥਾਮ ਅਤੇ ਦਵਾਇਆਂ ਦੀ ਸਹੀ ਵਰਤੋਂ ਬਾਰੇ ਦੱਸਿਆ । ਡਾ: ਵਿਜੈ ਕੁਮਾਰ, ਅਸਿਸਟੈਂਟ ਪਲਾਂਟ ਬਰੀਡਰ ਅਤੇ ਡਾ: ਅਨਿਲ ਖੋਖਰ, ਅਸਿਟੈਂਟ ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਫਸਲਾਂ ਦੀਆਂ ਉੱਤਮ ਕਿਸਮਾਂ ਅਤੇ ਵਿਗਿਆਨਿਕ ਢੰਗ ਨਾਲ ਖੇਤੀ ਕਰਨ ਦੀਆਂ ਨਵੀਂਆਂ ਤਕਨੀਕਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ । ਇਸ ਦੌਰਾਨ ਪਿੰਡ ਵਿਚ ਨਿਕਰਾ ਸਕੀਮ ਦੇ ਅਧੀਨ ਸੋਧ ਕੀਤੇ ਗਏ ਟੋਬੇ ਵਿਚ ਮੱਛੀਆਂ ਦੀ ਪੁੰਗ ਪਿੰਡ ਦੀ ਸਰਪੰਚ ਸ਼੍ਰੀਮਤੀ ਸੁਰਿੰਦਰ ਕੌਰ ਅਤੇ ਬਾਕੀ ਪਿੰਡ ਵਾਸੀਆਂ ਦੀ ਮੌਜੂਦਗੀ ਵਿਚ ਛੱਡੀ ਗਈ ਤਾਂ ਜੋ ਗ੍ਰਾਮ ਪੰਚਾਇਤ ਦੀ ਆਮਦਨੀ ਵਿਚ ਵਾਧਾ ਹੋ ਸਕੇ । ਕੈਂਪ ਦੇ ਦੌਰਾਨ ਪੰਚ ਸ਼੍ਰੀ ਮਹਿੰਦਰ ਸਿੰਘ, ਸ਼੍ਰੀ ਵਿਕਰਮ ਸਿੰਘ ਅਤੇ ਸ਼੍ਰੀ ਚਰਨ ਸਿੰਘ ਨੇ ਆਪਣੇ ਵਿਚਾਰ ਸਾਂਝੇ ਕੀਤੇ । ਇਸਦੇ ਨਾਲ ਹੀ ਪਿੰਡ ਦੀ ਸਰਪੰਚ ਸ਼੍ਰੀਮਤੀ ਸੁਰਿੰਦਰ ਕੌਰ ਨੇ ਕੰਢੀ ਖੋਜ਼ ਕੇਂਦਰ ਦਾ ਇਹ ਕੈਂਪ ਲਗਾਉਣ ਲਈ ਧੰਨਵਾਦ ਕੀਤਾ ।

ਰੋਜ਼ਾਨਾ ਪੰਜਾਬੀਅਤ ਦਾ ਪਹਿਰੇਦਾਰ

ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ

ਸਰਕਾਰੀ ਸਕੂਲ ਹੈਬੋਵਾਲ ਬੀਤ ਵਿਖੇ ਕਿਸਾਨ ਜਾਗਰੂਕਤਾ ਕੈਂਪ ਲਗਾਇਆ ਗਿਆ

ਗੜ੍ਹਸ਼ੰਕਰ, 22 ਮਾਰਚ (ਅਸ਼ਵਨੀ ਸ਼ਰਮਾ)

ਸਰਕਾਰੀ ਸੀਨੀਅਰ ਸੰਕੈਂਡਰੀ ਸਕੂਲ ਹੈਬੋਵਾਲ ਬੀਤ ਵਿਖੇ ਬੀਤ ਇਲਾਕੇ ਦੇ ਵੱਖ-ਵੱਖ ਪਿੰਡਾ ਦੇ ਅਗਾਹ ਵਧੂ ਕਿਸਾਨਾ ਨੂੰ ਖੇਤੀ ਦੀਆ ਫਸਲਾ ਨੂੰ ਸਮੇ ਸਿਰ ਬੀਜਣ ਤੇ ਉਹਨਾ ਨੂੰ ਬਿਮਾਰੀਆ ਤੋ ਬਚਾਉਣ ਲਈ ਦਵਾਈਆ ਦਾ ਸਮੇ-ਸਮੇ ਤੇ ਛੜਕਾਅ ਕਰਨ ਸਬੰਧੀ ਜਾਣਕਾਰੀ ਦੇਣ ਲਈ ਪੀ.ਏ.ਯੂ ਲੁਧਿਆਣਾ ਤੇ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਲੋ ਦੇ ਮਾਹਰ ਵਿਗਿਆਨੀਆ ਨੇ ਸਰਕਾਰੀ ਸੀਨੀਅਰ ਸੰਕੈਂਡਰੀ ਸਕੂਲ ਹੈਬੋਵਾਲ ਤੇ ਗੁਰਬਿਸ਼ਨਪੁਰੀ ਭਵਾਨੀਪੁਰ ਦੇ ਸਮੂਹ ਸਟਾਫ ਦੇ ਵਿਸ਼ੇਸ਼ ਸਹਿਯੋਗ ਨਾਲ ਪਲੇਠਾ ਕਿਸਾਨ ਜਾਗਰੂਕ ਕੈਂਪ ਲਗਾਇਆ ਗਿਆ। ਇਸ ਮੌਕੇ ਕਿਸਾਨਾ ਨੂੰ ਜਾਣਕਾਰੀ ਦਿੰਦਿਆ ਡਾਇਰੈਕਟਰ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਡਾਂ ਐਸ.ਸੀ.ਸ਼ਰਮਾ ਨੇ ਕਿਹਾ ਕਿ ਮੌਸਮ ਦੇ ਬਦਲਾਅ ਦੇ ਅਨੁਸਾਰ ਫਸਲ ਦੀ ਬਿਜਾਈ ਕਰਨੀ ਚਾਹੀਦੀ ਹੈ ਤੇ ਫਸਲ ਤੇ ਪੈਂਦੇ ਵੱਖ-ਵੱਖ ਬਿਮਾਰੀਆ ਦੇ ਪ੍ਰਭਾਵ ਪੈਣ ਤੇ ਪਹਿਲਾ ਹੀ ਮਾਹਰ ਵਿਗਿਆਨੀਆ ਤੋ ਸਲਾਹ ਲੈਣ ਤੋ ਬਾਅਦ ਦਵਾਈਆ ਦਾ ਛੜਕਾਅ ਕਰਨਾ ਚਾਹੀਦਾ ਹੈ ਅਤੇ ਫਸਲ ਦੀ ਬਜਾਈ ਹਮੇਸ਼ਾ ਖੇਤੀ ਮਾਹਰਾ ਵਲੋ ਪਾਸ ਕੀਤੇ ਬੀਜਾ ਤੋ ਸੋਧ ਕੇ ਕਰਨੀ ਚਾਹੀਦੀ ਹੈ ਇਸ ਮੌਕੇ ਡਾਂ ਕਮਲਦੀਪ ਸਿੰਘ ਸੰਘਾ ਡਾਇਰੈਕਟਰ ਆਤਮਾ ਪ੍ਰੋਜੈਕਟ ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਨਗਰ ਨੇ ਕਿਸਾਨਾ ਨੂੰ ਸਰਕਾਰ ਵਲੋ ਦਿਤੀਆ ਜਾਦੀਆ ਆਤਮਾ ਸਕੀਮ ਤਹਿਤ ਜਿਹਨਾ ਚ ਸ਼ਹਿਦ ਦੀਆ ਮੱਖੀਆ ਪਾਲਣਾ, ਖੁੰਭਾ, ਪਸ਼ੂ ਪਾਲਣ ਤੇ ਹੋਰ ਸਹਾਇਕ ਧੰਦਿਆ ਬਾਰੇ ਵਿਸਥਾਰ ਨਾਲ ਜਾਣਕਾਰੀ ਦਿਤੀ। ਇਸ ਕੈਂਪ ਚ ਡਾਂ ਰੋਸ਼ਨ ਲਾਲ ਖੇਤੀਬਾੜੀ ਵਿਕਾਸ ਅਫਸਰ ਗੜ੍ਹਸ਼ੰਕਰ, ਡਾਂ ਕੇ.ਕੇ ਗਿੱਲ ਸਹਾਇਕ ਕ੍ਰਿਸ਼ੀ ਮੌਸਮ ਵਿਗਿਆਨੀ ਲੁਧਿਆਣਾ, ਡਾ.ਪੀ.ਕੇ ਸਿੱਧੂ ਕ੍ਰਿਸ਼ੀ ਮੌਸਮ ਵਿਗਿਆਨੀ ਲੁਧਿਆਣਾ, ਡਾਂ ਮਨਪ੍ਰੀਤ ਸਿੰਘ ਸਹਾਇਕ ਕ੍ਰਿਸ਼ੀ ਵਿਗਿਆਨੀ ਕੇਂਦਰ ਲਗੜੋਆ, ਡਾ ਹਰਸਵਰਧਨ ਸਹਾਇਕ ਮੌਸਮ ਵਿਗਿਆਨੀ ਬੱਲੋਵਾਲ ਸੌਖੜੀ, ਡਾਂ ਵਿਵੇਕ ਸ਼ਰਮਾ ਸਹਾਇਕ ਭੂਮੀ ਵਿਗਿਆਨੀ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਨੇ ਕਿਸਾਨਾ ਨੂੰ ਫਸਲਾ ਦੀਆ ਵੱਖ-ਵੱਖ ਬਿਮਾਰੀਆ ਤੇ ਉਹਨਾ ਤੋ ਬਚਾਅ ਸਬੰਧੀ ਵਿਸਥਾਰ ਨਾਲ ਜਾਣਕਾਰੀ ਦਿਤੀ। ਇਸ ਮੌਕੇ ਬੀਤ ਇਲਾਕੇ ਦੇ ਕਿਸਾਨਾ ਜਿਹਨਾ ਚ ਮਾਸਟਰ ਧਰਮਪਾਲ ਸ਼ਰਮਾ ਗੜ੍ਹੀਮਾਨਸੋਵਾਲ ਨੇ ਜਿਥੇ ਲਗਾਏ ਇਸ ਕੈਂਪ ਲਈ ਖੇਤੀ ਮਾਹਰਾ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ ਉਥੇ ਉਹਨਾ ਨੇ ਕਿਹਾ ਕਿ ਅਸੀ ਖੇਤੀਬਾੜੀ ਮਾਹਰਾ ਵਲੋ ਦਸੇ ਅਨੁਸਾਰ ਫਸਲਾ ਬੀਜਣ ਲਈ ਤਿਆਰ ਹਾ ਪਰ ਬੀਤ ਇਲਾਕੇ ਦੇ ਕਿਸਾਨਾ ਦੀਆ ਫਸਲਾ ਤੇ ਜੰਗਲੀ ਜਾਨਵਰਾ ਤੇ ਅਵਾਰਾ ਪਸ਼ੂਆ ਵਲੋ ਕੀਤੇ ਜਾਦੇ ਹਮਲੇ ਦਾ ਸਹੀ ਹੱਲ ਕੀਤਾ ਜਾਣਾ ਚਾਹੀਦਾ ਹੈ। ਇਸ ਕੈਂਪ ਚ ਬੀਤ ਇਲਾਕੇ ਦੇ ਖੇਤੀਬਾੜੀ ਦਫਤਰ ਇਚਾਂਰਜ ਉਮਪਾਲ ਡੂੰਬਲਾ, ਕਾਬਲ ਸਿੰਘ,ਹਰਬਿਲਾਸ, ਅਮਰੀਕ ਚੰਦ, ਸੁਰੇਸ਼ ਕੁਮਾਰ ਤੇ ਇਲਾਵਾ ਸਰਕਾਰੀ ਸੀਨੀਅਰ ਸੰਕੈਂਡਰੀ ਸਕੂਲ ਹੈਬੋਵਾਲ ਦੇ ਪ੍ਰਿੰਸੀਪਲ ਰਾਣਾ ਸੁਧੀਰ ਸਿੰਘ, ਬੀਤ ਭਲਾਈ ਕਮੇਟੀ ਦੇ ਪ੍ਰਧਾਨ ਦਰਸ਼ਨ ਸਿੰਘ ਟੱਬਾ, ਜਗਦੀਸ਼ ਸ਼ਰਮਾ, ਸਰਪੰਚ ਪ੍ਰਦੀਪ ਰੰਗੀਲਾ, ਸਰਪੰਚ ਯਾਦਵਿੰਦਰ ਸਿੰਘ ਬਿੰਦੂ, ਸਰਪੰਚ ਵਿਨੋਦ ਕੁਮਾਰ ਬੱਸੀ, ਸਰਪੰਚ ਸੂਰਜ ਰਾਣਾ, ਰਾਣਾ ਬਲਦੇਵ ਸਿੰਘ, ਗਿਆਨ ਸਿੰਘ ਭੱਠਲ, ਜੋਗਾ ਸਿੰਘ ਪੁਰਾਣੀ, ਲਾਲਾ ਰਵਿੰਦਰ ਪੁਰੀ, ਰਤਨ ਸਿੰਘ ਕਾਲੇਵਾਲ, ਕਾਮਰੇਡ ਚਰਨਜੀਤ ਨੈਣਵਾਂ, ਮਾਸਟਰ ਅਮਰੀਕ ਦਿਆਲ, ਮਾ ਜਸਪਾਲ ਸਿੰਘ, ਮਾ ਨੰਦ ਸਿੰਘ, ਡੀ.ਪੀ ਸੁਰਿੰਦਰ ਬੈਸ, ਗਿਰਧਾਰੀ ਲਾਲ ਹੈਬੋਵਾਲ, ਮਾਸਟਰ ਧਰਮਪਾਲ ਸ਼ਰਮਾ, ਮਾ ਰਾਮ ਸਰੂਪ, ਦਿਲਦਾਰ ਸਿੰਘ, ਸੁਖਵੀਰ ਸਿੰਘ ਪੰਡੋਰ ਤੇ ਇਲਾਵਾ ਭਾਰੀ ਗਿਣਤੀ ਇਲਾਕੇ ਦੇ ਕਿਸਾਨ ਹਾਜਰ ਸਨ। ਆਖਰ ਚ ਕਿਸਾਨਾ ਨੂੰ ਸਬਜੀਆ ਤੇ ਹੋਰ ਬੀਜਣ ਵਾਸਤੇ ਬੀਜ ਵੀ ਦਿਤੇ ਗਏ।

ਵਿਉਂਤਬੱਧ ਤਰੀਕੇ ਨਾਲ ਵਪਾਰਕ ਖੇਤੀ ਕਰਨੀ ਮੁੱਖ ਲੋੜ-ਢੀਂਡਸਾ

ਕੰਡੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿਖੇ ਆਯੋਜਿਤ ਖੇਤਰੀ ਕਿਸਾਨ ਮੇਲੇ ਦੇ ਮੌਕੇ ਪ੍ਰਦਰਸ਼ਨੀ ਪਲਾਂਟ ਅਤੇ ਨੁਮਾਇਸ਼ ਵੇਖਦੇ ਹੋਏ ਸ੍ਰੀ ਅਵਤਾਰ ਸਿੰਘ ਢੀਂਡਸਾ ਮੈਂਬਰ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਪੀ.ਏ.ਯੂ. ਲੁਧਿਆਣਾ। ਉਨ੍ਹਾਂ ਨਾਲ ਡਾ: ਨਛੱਤਰ ਸਿੰਘ ਮੱਲ੍ਹੀ, ਡਾਇਰੈਕਟਰ ਪਸਾਰ ਅਤੇ ਡਾ: ਸੁਭਾਸ਼ ਸ਼ਰਮਾ ਡਾਇਰੈਕਟਰ। ਤਸਵੀਰ : [illegible]

ਬਲਾਚੌਰ, 20 ਮਾਰਚ [illegible]

[illegible]

ਰੋਜ਼ਾਨਾ ਪੰਜਾਬੀਅਤ ਦਾ ਪਹਿਰੇਦਾਰ
ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ
ਮੁੱਖ ਸੰਪਾਦਕ: ਸਰਨਜੀਤ ਬੈਂਸ | The Times of Punjab (Daily) | 6 ਮਾਘ, ਨਾਨਕਸ਼ਾਹੀ ਸੰਮਤ 544
ਚੰਡੀਗੜ੍ਹ, 18 ਜਨਵਰੀ 2013 | ਵੈਬਸਾਈਟ : www.thetimesofpunjab.com | ਈ-ਮੇਲ: news@thetimesofpunjab.com, editor@thetimesofpunjab.com | ਸਫ਼ਾ-3, ਐਚ-208

ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਵਲੋਂ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਆਯੋਜਿਤ

ਬਲਾਚੌਰ, 17 ਜਨਵਰੀ (ਸੁਭਾਸ ਜੋਸ਼ੀ) ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਲੋਂ ਨਿਕਰਾ ਪ੍ਰੋਜੈਕਟ ਅਧੀਨ ਆਉਂਦੇ ਪਿੰਡ ਅੰਚਲਪੁਰ ਵਿਖੇ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਕਰਵਾਈ ਗਈ।

ਇਸਦਾ ਮੁੱਖ ਵਿਸ਼ਾ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਦੀ ਕਾਸ਼ਤ ਬਿਮਾਰੀਆਂ ਅਤੇ ਮਿੱਟੀ ਦੀ ਸਿਹਤ ਸੀ। ਇਸ ਗੋਸ਼ਟੀ ਵਿਚ ਸੱਠ ਕਿਸਾਨਾਂ ਨੇ ਭਾਗ ਲਿਆ ਅਤੇ ਫਸਲਾਂ ਦੀਆਂ ਮੁੱਖ ਸਮੱਸਿਆਂਵਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕੀਤੀ। ਜਿਸ ਵਿਚ ਡਾ. ਸੁੱਖਵਿੰਦਰ ਸਿੰਘ, ਸੀਨੀਅਰ ਫਸਲ ਵਿਗਿਆਨੀ ਨੇ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਦੀ ਕਾਸ਼ਤ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਉਨ੍ਹਾਂ ਨੇ ਕਣਕ ਵਿਚ ਨਦੀਨਾਂ ਦੀ ਰੋਕਥਾਮ ਬਾਰੇ ਸਿਫ਼ਾਰਸ਼ ਕੀਤੀਆਂ ਦਵਾਇਆਂ ਦੀ ਵਰਤੋਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਡਾ. ਐਸ. ਐਸ. ਬਾਵਾ, ਭੂਮੀ ਵਿਗਿਆਨੀ ਅਤੇ ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾ, ਸਹਾਇਕ ਭੂਮੀ ਵਿਗਿਆਨੀ ਨੇ ਮਿੱਟੀ ਨਿਰੀਖਣ ਸਬੰਧੀ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੁਚੱਜੀ ਵਰਤੋਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਜਦਕਿ ਸ਼੍ਰੀ ਰਾਕੇਸ਼ ਸ਼ਰਮਾ, ਸਹਾਇਕ ਕੀਟ ਵਿਗਿਆਨੀ ਨੇ ਫਸਲਾਂ ਵਿਚ ਆਉਣ ਵਾਲੇ ਕੀੜੇਆਂ ਦੇ ਹਮਲੇ ਅਤੇ ਉਨ੍ਹਾਂ ਦੀ ਰੋਕਥਾਮ ਕਰਨ ਲਈ ਉਪਰਾਲੇ ਦੱਸੇ ਅਤੇ ਕਣਕ ਦੀ ਪੀਲੀ ਕੁੰਗੀ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਇਸ ਤੋਂ ਇਲਾਵਾ ਇਨ੍ਹਾਂ ਵਿਗਿਆਨੀਆਂ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਵਾਤਾਵਰਣ ਦੇ ਬਦਲਾਓ ਸਬੰਧੀ, ਸੂਰਜੀ ਊਰਜਾ, ਗੋਬਰ ਗੈਸ ਪਲਾਂਟ, ਤੁਪਕਾ ਅਤੇ ਫੁਆਰਾ ਸਿੰਚਾਈ, ਪੌਲੀ ਅਤੇ ਨੈਟਹਾਊਸ ਬਾਰੇ ਜਾਗਰੂਕ ਕਰਵਾਇਆ ਅਤੇ ਇਨ੍ਹਾਂ ਨੂੰ ਅਪਨਾਉਣ ਬਾਰੇ ਪ੍ਰੇਰਿਤ ਕੀਤਾ ਤਾਂ ਜੋ ਖੇਤੀਬਾੜੀ ਹੋਰ ਲਾਹੇਵੰਦ ਹੋ ਸਕੇ। ਇਸ ਮੌਕੇ ਤੇ ਕਿਸਾਨਾਂ ਨੂੰ ਉਨ੍ਹਾਂ ਦੇ ਖੇਤਾਂ ਦੇ 'ਭੂਮੀ ਸਿਹਤ ਕਾਰਡ' ਵੀ ਵੰਡੇ ਗਏ।

DAINIK BHASKAR 11.03.2014

ਨਵਾਂਸ਼ਹਰ

ਬਲ्लोवाल सौंखड़ी में किसान मेला में पीएयू के कुलवंत सिंह आहलूवालिया ने कहा

कंडी क्षेत्र में फलों के उत्पादन की अपार संभावनाएं, किसान ध्यान दें

भास्कर न्यूज | बलाचौर

पंजाब एग्रीकल्चर यूनिवर्सिटी (पीएयू) की ओर से सोमवार को बल्लोवाल सौंखड़ी में किसान मेले लगाया गया। यूनिवर्सिटी के प्रबंधन बोर्ड के सदस्य कुलवंत सिंह आहलूवालिया ने मेले का उद्घाटन किया और वाइस चांसलर डा. बलदेव सिंह ढिल्लों ने मेले की अध्यक्षता की। इस दौरान आहलूवालिया ने कहा कि भारत की 60 फीसदी आबादी कृषि से संबंधित है, जबकि देश की आय का 14 फीसदी हिस्सा ही कृषि से प्राप्त होता है। कृषि में मुश्किलें बढ़ती जा रही हैं और लाभ कम होता जा रहा है। इस धंधे को फायदेमंद बनाने के लिए किसानों को सहायक धंधे अपनाने चाहिए। कंडी क्षेत्र में फलों के उत्पादन की अपार संभावनाएं हैं और किसानों को इस तरफ ध्यान देना चाहिए।

किसान मेले लगाई प्रदर्शनियां वेखकर कुलवंत सिंह आहलूवालिया ने खेती की तकनीक के बारे में सुझाव दिए।

वाइस चांसलर डा. बलदेव सिंह ढिल्लों ने कहा कि किसान खुद एक वैज्ञानिक हैं लेकिन फिर भी इन मेलों में किसान बहुत कुछ सीखते हैं। पानी व पर्यावरण कृषि क्षेत्र के लिए बहुत जरूरी है, लेकिन प्राकृतिक स्रोतों का संयम से प्रयोग करना चाहिए। उन्होंने किसानों से रसायनों के गैर जरूरी प्रयोग को बंद करने की अपील भी की और घरेलू बगीचे बनाने की प्रेरणा दी। उनसे पूर्व यूनिवर्सिटी के खोज निदेशक डा. सतवीर सिंह गोसल ने खोज कार्यों की जानकारी दी। उन्होंने कहा कि इन खोज कार्यों का मुख्य उद्देश्य फसलों का अधिक उत्पादन प्राप्त करना और विभिन्न पर्यावरण परिस्थितियों में किसानों को अच्छी कारगुजारी दिखाने के लिए प्रेरित करना है। पंजाब के कुल भौगोलिक क्षेत्र का 8 फीसदी हिस्सा कंडी क्षेत्र में आता है और इस रकबे में फलों की खेती बढ़िया ढंग से की जा सकती है। वहीं, शिक्षा प्रसार के निदेशक डा. हरविंदर सिंह धालीवाल ने नवीन तकनीकों के बारे में जानकारी दी। उन्होंने कहा कि किसानों विज्ञानियों के साथ इन मेलों के माध्यम से सीधा संपर्क कायम कर सकते हैं। यूनिवर्सिटी द्वारा पंजाब के 17 जिलों में कृषि विज्ञान केंद्र स्थापित किए गए हैं, यहां 100 से अधिक तकनीकी प्रशिक्षण दिया जा रहा है। कार्यक्रम के अंत में कंडी खोज केंद्र के निदेशक डा. एससी शर्मा ने मेहमानों और किसानों का धन्यवाद किया। इस दौरान यूनिवर्सिटी के विभागों ने प्रदर्शनियां भी लगाई।

ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਟੀ ਨੇ ਲਾਇਆ ਕਿਸਾਨ ਮੇਲਾ

ਕੰਢੀ ਖੇਤਰ 'ਚ ਫਲਾਂ ਦੀ ਖੇਤੀ ਲਈ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ ਹਨ : ਆਹਲੂਵਾਲੀਆ

ਨਵਾਂ ਸ਼ਹਿਰ, 10 ਮਾਰਚ (ਜਤਿੰਦਰ ਪਾਲ ਸਿੰਘ) : ਪੰਜਾਬ ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਮਾਰਚ ਮਹੀਨੇ ਵਿੱਚ ਆਯੋਜਿਤ ਕੀਤੇ ਜਾਣ ਵਾਲੇ ਕਿਸਾਨ ਮੇਲਿਆਂ ਦੀ ਲੜੀ ਵਿਚੋਂ ਤੀਜਾ ਕਿਸਾਨ ਮੇਲਾ ਕੰਢੀ ਖੇਤਰ ਦੇ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ, ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਨਗਰ ਵਿਖੇ ਅੱਜ ਲਗਾਇਆ ਗਿਆ। ਅਗਾਂਹ ਵਧੂ ਫ਼ਲ ਉਤਪਾਦਕ ਅਤੇ ਯੂਨੀਵਰਸਟੀ ਦੇ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਦੇ ਮੈਂਬਰ ਕੁਲਵੰਤ ਸਿੰਘ ਆਹਲੂਵਾਲੀਆ ਨੇ ਇਸ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕੀਤਾ ਜਦਕਿ ਯੂਨੀਵਰਸਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਉਦਘਾਟਨੀ ਸਮਾਰੋਹ ਦੀ ਪ੍ਰਧਾਨਗੀ ਕੀਤੀ।

ਇਸ ਮੌਕੇ ਸ. ਆਹਲੂਵਾਲੀਆ ਨੇ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਭਾਰਤ ਦੀ ਖੇਤੀ ਨਾਲ ਦੇਸ਼ ਦੀ ਕੁੱਲ 60 ਫ਼ੀ ਸਦੀ ਆਬਾਦੀ ਸਬੰਧਤ ਹੈ ਜਦਕਿ ਕੁੱਲ ਦੇਸ਼ ਦੀ ਆਮਦਨ ਦਾ 14% ਹਿੱਸਾ ਹੀ ਇਸ ਪਾਸੋਂ ਆਉਂਦਾ ਹੈ। ਯੂਨੀਵਰਸਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਇਸ ਮੌਕੇ ਕਿਸਾਨਾਂ ਨੂੰ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਕਿਸਾਨ ਹੀ ਅਪਣੇ ਆਪ ਵਿਚ ਸਾਇੰਸਦਾਨ ਹੁੰਦਾ ਹੈ। ਇਨ੍ਹਾਂ ਕਿਸਾਨ ਮੇਲਿਆਂ ਤੋਂ ਕਿਸਾਨ ਸਾਇੰਸਦਾਨਾਂ ਤੋਂ ਕੁਝ ਸਿੱਖਦੇ ਹਨ ਅਤੇ ਕਿਸਾਨਾਂ ਵਲੋਂ ਪ੍ਰਦਾਨ ਕੀਤੀ ਸੂਚਨਾ ਨਵੀਆਂ ਖੋਜਾਂ ਦਾ ਮੁੱਢ ਬੰਝਦੀ ਹੈ। ਡਾ. ਢਿੱਲੋਂ ਨੇ ਦਸਿਆ ਕਿ ਇਸ ਵਾਰ ਕਿਸਾਨ ਮੇਲੇ ਦਾ ਮੁੱਖ ਉਦੇਸ਼ ਬੇਲੋੜੇ ਰਸਾਇਣਾਂ ਉਪਰ ਖ਼ਰਚਾ ਘਟਾਉ, ਵਾਤਾਵਰਣ ਬਚਾਉ ਮੁਨਾਫ਼ਾ ਵਧਾਉ ਰੱਖਿਆ ਗਿਆ ਹੈ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਕੰਢੀ ਖੇਤਰ ਵਿਚ ਫ਼ਲਾਂ ਦੀ ਖੇਤੀ ਕਰਨ ਦੀ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ ਹਨ।

ਇਸ ਤੋਂ ਪਹਿਲਾਂ ਯੂਨੀਵਰਸਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਖੋਜ ਡਾ. ਸਤਿਬੀਰ ਸਿੰਘ ਗੋਸਲ ਨੇ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਕੀਤੇ ਜਾ ਰਹੇ ਖੋਜ ਕਾਰਜਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕੀਤੀ। ਯੂਨੀਵਰਸਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਪਸਾਰ ਸਿਖਿਆ ਡਾ. ਹਰਵਿੰਦਰ ਸਿੰਘ ਧਾਲੀਵਾਲ ਨੇ ਜੀ ਆਇਆਂ ਦੇ ਸ਼ਬਦ ਬੋਲਦਿਆਂ ਕਿਹਾ ਕਿ ਇਨ੍ਹਾਂ ਕਿਸਾਨ ਮੇਲਿਆਂ ਵਿਚ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਵਿਕਸਤ ਕੀਤੀਆਂ ਗਈਆਂ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਤਕਨਾਲੋਜੀਆਂ ਪ੍ਰਦਰਸ਼ਤ ਕੀਤੀਆਂ ਜਾਂਦੀਆਂ ਹਨ। ਉਨ੍ਹਾਂ ਕਿਸਾਨ ਵੀਰਾਂ ਨੂੰ ਅਪੀਲ ਕੀਤੀ ਕਿ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਤਿਆਰ ਕੀਤੀ ਜਾਣਕਾਰੀ ਕਿਤਾਬਚਿਆਂ ਵਿਚ ਦਰਜ ਹੁੰਦੀ ਹੈ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਯੂਨੀਵਰਸਟੀ ਦੀਆਂ ਪ੍ਰਕਾਸ਼ਨਾਵਾਂ ਦੇ ਨਾਲ ਜੁੜ ਕੇ ਅਸੀਂ ਅਪਣੀ ਖੇਤੀ ਦੀ ਨੁਹਾਰ ਬਦਲ ਸਕਦੇ ਹਾਂ। ਅੰਤ ਵਿਚ ਧਨਵਾਦ ਦੇ ਸ਼ਬਦ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਦੇ ਡਾਇਰੈਕਟਰ ਡਾ. ਐਸ ਸੀ. ਸ਼ਰਮਾ ਨੇ ਕਹੇ। ਇਸ ਮੌਕੇ ਯੂਨੀਵਰਸਟੀ ਦੇ ਵੱਖ ਵੱਖ ਵਿਭਾਗਾਂ ਵਲੋਂ ਪ੍ਰਦਰਸ਼ਨੀਆਂ ਵੀ ਲਗਾਈਆਂ ਗਈਆਂ। ਕਿਸਾਨਾਂ ਦੇ ਸਵਾਲਾਂ ਦੇ ਜਵਾਬ ਵੱਖ ਵੱਖ ਵਿਸ਼ਿਆਂ ਵਸਤੂਆਂ ਮਾਹਰਾਂ ਵਲੋਂ ਵੀ ਦਿਤੇ ਗਏ।

AJIT SAMACHAR – 11-03-2014

ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿਖੇ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕਰਦੇ ਡਾ: ਆਹਲੂਵਾਲੀਆ, ਡਾ: ਢਿੱਲੋਂ ਅਤੇ ਹੋਰ ਪਤਵੰਤੇ।

ਮੇਲੇ ਦੌਰਾਨ ਪ੍ਰਦਰਸ਼ਨੀਆਂ ਦਾ ਨਿਰੀਖਣ ਕਰਦੇ ਮੁੱਖ ਮਹਿਮਾਨ ਅਤੇ ਹੋਰ।

ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਵਿਖੇ ਕਿਸਾਨ ਮੇਲਾ

ਕਿਸਾਨ ਦਵਾਈਆਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੀਮਤ ਵਰਤੋਂ ਕਰਨ-ਆਹਲੂਵਾਲੀਆ, ਢਿੱਲੋਂ

ਭੰਵੀ, 10 ਮਾਰਚ (ਨਰੇਸ਼ ਧੌਲਾ-ਹਾੜੀ ਅਤੇ ਸਾਉਣੀ ਦੀਆਂ ਫ਼ਸਲਾਂ ਸਬੰਧੀ ਵਿਗਿਆਨਿਕ ਜਾਣਕਾਰੀ ਦੇਣ ਤਹਿਤ ਪੰਜਾਬ ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਿਟੀ ਲੁਧਿਆਣਾ ਵੱਲੋਂ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ (ਬਲਾਚੌਰ) ਜ਼ਿਲਾ ਭਗਤ ਸਿੰਘ ਨਗਰ ਵਿਖੇ ਕਿਸਾਨ ਮੇਲਾ ਲਗਾਇਆ ਗਿਆ। ਜਿਸ ਵਿਚ ਯੂਨੀਵਰਸਿਟੀ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਦੇ ਮੈਂਬਰ ਕੁਲਵੰਤ ਸਿੰਘ ਆਹਲੂਵਾਲੀਆ ਮੁੱਖ ਮਹਿਮਾਨ ਵਜੋਂ ਸ਼ਾਮਿਲ ਹੋਏ ਅਤੇ ਮੇਲੇ ਦੀ ਪ੍ਰਧਾਨਗੀ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਕੀਤੀ। ਉਨ੍ਹਾਂ ਵਿਕੇਂਦਰ ਕਿਸਾਨਾਂ ਨੂੰ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਦਵਾਈਆਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੀਮਤ ਵਰਤੋਂ ਕਰਨ ਨਾਲ ਹੀ ਭਵਿੱਖ ਸੁਨਹਿਰਾ ਹੋ ਸਕਦਾ ਹੈ ਅਤੇ ਕੰਢੀ ਖੇਤਰ ਵਿਚ ਬਾਗਬਾਨੀ ਤੇ ਖੇਤੀਬਾੜੀ ਦੇ ਸ਼ਾਂਝੇ ਵਿਕਾਸ ਲਈ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੀਮਤ ਵਰਤੋਂ ਕਰਨੀ ਬਹੁਤ ਜ਼ਰੂਰੀ ਹੈ ਕਿਉਂਕਿ ਇਸ ਨਾਲ ਜਿੱਥੇ ਪੈਸੇ ਦੀ ਬੱਚਤ ਹੁੰਦੀ ਹੈ ਉੱਥੇ ਮਨੁੱਖੀ ਸਰੀਰ ਨੂੰ ਲੱਗਣ ਵਾਲੀਆਂ ਬਿਮਾਰੀਆਂ ਤੋਂ ਵੀ ਬਚਾਅ ਕੀਤੀ ਜਾ ਸਕਦੀ ਹੈ। ਮੇਲੇ 'ਚ ਵਿਗਿਆਨੀਆਂ ਦੀ ਅਗਵਾਈ ਹੇਠ ਕਿਸਾਨਾਂ ਨੂੰ ਖੇਤੀਬਾੜੀ ਸਾਹਿਤ ਨਾਲ ਜੁੜਨਾ ਚਾਹੀਦਾ ਹੈ। ਇਸ ਤੋਂ ਇਲਾਵਾ ਸਤਵੀਰ ਸਿੰਘ ਗੋਸਲ ਡਾਇਰੈਕਟਰ ਖੋਜ, ਡਾ. ਐਸ. ਧਾਲੀਵਾਲ ਡਾਇਰੈਕਟਰ ਪ੍ਰਸਾਰ ਸਿੱਖਿਆ ਨੇ ਅਪੀਲ ਕੀਤੀ ਕਿ ਦਵਾਈਆਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੀਮਤ ਵਰਤੋਂ ਕਰਨੀ ਬਹੁਤ ਜ਼ਰੂਰੀ ਹੈ ਕਿਉਂਕਿ ਇਸ ਨਾਲ ਜਿੱਥੇ ਪੈਸੇ ਦੀ ਬੱਚਤ ਹੁੰਦੀ ਹੈ ਉੱਥੇ ਮਨੁੱਖੀ ਸਰੀਰ ਨੂੰ ਲੱਗਣ ਵਾਲੀਆਂ ਬਿਮਾਰੀਆਂ ਤੋਂ ਵੀ ਬਚਾਅ ਕੀਤੀ ਜਾ ਸਕਦੀ ਹੈ। ਮੇਲੇ 'ਚ ਕਿਸਾਨਾਂ ਨਾਲ ਸਬੰਧਤ ਵੱਖ-ਵੱਖ ਸਟਾਲ ਅਤੇ ਪਸ਼ੂ ਡਾਲਾਂ ਤੋਂ ਵੀ ਲਗਾਇਆ। ਕਿਸਾਨਾਂ ਦੇ ਮਨੋਰੰਜਨ ਲਈ ਗੁਰਸੇਵਾ ਨਨਹੇੜੀਆ ਕਾਲਜ ਮਨਾਲ (ਗੜ੍ਹਸ਼ੰਕਰ) ਦੀਆਂ ਵਿਦਿਆਰਥਣਾਂ ਨੇ ਨਾਟਕ 'ਪਾਣੀ ਵਚਾਓ' ਪੇਸ਼ ਕੀਤਾ। ਚੌਧਰੀ ਰਾਮ ਪ੍ਰਕਾਸ਼ ਸਾਬਕਾ ਡਾਇਰੈਕਟਰ ਨੇ ਕੰਢੀ ਇਲਾਕੇ ਵਿਚ ਕਿਸਾਨਾਂ ਨੂੰ ਆ ਰਹੀਆਂ ਮੁਸ਼ਕਲਾਂ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ। ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਐਸ.ਸੀ.ਸ਼ਰਮਾ ਨੇ ਉਪਲਬੱਧੀਆਂ ਵਾਰੇ ਚਾਨਣਾ ਪਾਇਆ। ਮੇਲੇ ਵਿਚ ਡਾ. ਐਮ.ਆਈ ਐਸ. ਰਿੰਨ, ਡਾ. ਟੀ.ਐਸ. ਬਿੰਦ, ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾ , ਡਾ. ਰਾਜ ਕੁਮਾਰ ਖੇਤੀਬਾੜੀ ਅਫ਼ਸਰ ਬਲਾਚੌਰ ਅਤੇ ਇਲਾਕੇ ਭਰ ਦੇ ਕਿਸਾਨ ਹਾਜ਼ਰ ਸਨ।

ਮੇਲੇ ਦੌਰਾਨ ਸਟੇਜ 'ਤੇ ਵਿਰਾਜਮਾਨ ਪ੍ਰਮੁੱਖ ਸ਼ਖ਼ਸੀਅਤਾਂ। ਤਸਵੀਰਾਂ : ਨਰੇਸ਼ ਧੌਲ

किसान मेले में मेडिकल चेकअप कैंप लगाया

♦ गुरु सेवा कॉलेज ऑफ नर्सिंग की छात्राओं ने सभ्याचारक कार्यक्रम पेश कर मन मोहा

संवाद सूत्र, मजारी : गुरु सेवा कॉलेज आफ नर्सिंग की ओर से जनरल सेक्रेटरी मेजर अजीत सिंह बैंस की अध्यक्षता में बल्लोवाल सौखड़ी किसान कंडी खोज केंद्र में पंजाब एग्रीकल्चर यूनिवर्सिटी द्वारा लगाए गए किसान मेले में लोगों को सुविधा के लिए निःशुल्क मेडिकल कैंप का आयोजन किया गया। इस अवसर पर विशेष रूप से पहुंचे यूनिवर्सिटी लुधियाना के वाइस चांसलर डा. बलदेव सिंह ढिल्लों ने अपने संबोधन में कहा कि गुरु सेवा सोसायटी द्वारा नर्सिंग क्षेत्र में छात्राओं को बेहतर शिक्षा मुहैया करवाने के अलावा लोगों की सुविधा के लिए निशुल्क मेडिकल कैंप का आयोजन करना प्रशंसनीय है। उन्होंने बच्चों को ट्रॉफी देकर सम्मानित किया। मेडिकल कैंप में करीब 95 मरीजों की जांच कर निःशुल्क दवाइयां दी गई। मरीजों के रक्त के टेस्ट, एचबी टेस्ट निशुल्क किए गए और जरूरतमंद लोगों को दवाइयां मुफ्त दी गई। वहीं इस मेले में गुरु सेवा की छात्राओं द्वारा पंजाबी सभ्याचारक प्रोग्राम और नाटक पेश करके पानी बचाओ का संदेश लोगों तक पहुंचाया गया। इस अवसर पर जंग बहादुर सोसायटी अध्यक्ष संत मसीह, सुरिंदर कौर, कंचन, मनदीप कौर और ज्ञान चंद पाठक व अन्य स्टाफ सदस्य मौजूद थे।

मजारी स्थित बल्लोवाल सौखडी किसान कंडी खोज केंद में आयोजित किसान मेले में मेधावी बच्चों को सम्मानित करते हुए वाइस चांसलर डॉ. बलदेव सिंह ढिल्लों व अन्य। (दाएं) मेले में कार्यक्रम पेश करती हुई छात्राएं।

DAINIK JAGRAN 12.03.2014

4 ਐਤਵਾਰ, 22 ਸਤੰਬਰ 2013 ਪੰਜਾਬ ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ

ਡਾ. ਸ਼੍ਰੀਨਿਵਾਸ ਰਾਓ ਵਲੋਂ ਬੁੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਦਾ ਦੌਰਾ

ਬਲਾਚੌਰ, 21 ਸਤੰਬਰ (ਸੁਭਾਸ਼ ਜੋਸ਼ੀ)

ਡਾ. ਸੀ ਐਚ ਸ਼੍ਰੀਨਿਵਾਸ ਰਾਓ, ਪ੍ਰੋਜੈਕਟ ਕੋਆਰਡੀਨੇਟਰ, ਅਫਰਿਪਡਾ (ਕਜਾਨੀ ਪ੍ਰੋਜੈਕਟ) ਹੈਦਰਾਬਾਦ ਤੋਂ ਚਿੰਨ ਦਿਨਾਂ ਦੇ ਦੌਰੇ ਤੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ (ਅਫਰਿਪਡਾ ਸੈਂਟਰ), ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿਖੇ ਆਏ। ਪ੍ਰੋਜੈਕਟ ਕੋਆਰਡੀਨੇਟਰ ਦਾ ਆਂਦਿਆ ਸੰਭਾਲਣ ਤੋਂ ਬਾਅਦ ਡਾ. ਰਾਓ ਦਾ ਇਸ ਸੰਟਰ ਤੇ ਸੰਭ ਤੋਂ ਪਹਿਲਾ ਆਏ। ਇਸ ਸੰਟਰ ਵਿਖੇ ਪਹੁੰਚਣ ਤੇ ਡਾ. ਐਸ. ਸੀ. ਸ਼ਰਮਾ, ਡਾਇਰੈਕਟਰ ਅਤੇ ਮੁੱਖ ਵਿਗਿਆਨੀ, ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਅਤੇ ਸਾਰੇ ਸਟਾਫ ਨੇ ਉਹਨਾਂ ਦਾ ਨਿੱਘਾ ਸਵਾਗਤ ਕੀਤਾ ਅਤੇ ਪ੍ਰੋਜੈਕਟ ਕੋਆਰਡੀਨੇਟਰ ਦਾ ਆਂਦਿਆ ਸੰਭਾਲਣ ਤੇ ਉਹਨਾਂ ਨੂੰ ਵਧਾਈ ਦਿੱਤੀ। ਇਸ ਦੌਰਾਨ ਡਾ. ਰਾਓ ਨੇ ਅਫਰਿਪਡਾ ਸੈਂਟਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਵੱਖ-ਵੱਖ ਖੋਜ ਤਜਰਬਿਆਂ, ਪ੍ਰਦਰਸ਼ਨੀਆਂ ਅਤੇ ਪ੍ਰਬੰਧਕਾਬਾਦਾਂ ਦਾ ਨਿਰੀਖਣ ਕੀਤਾ। ਡਾ. ਰਾਓ ਨੇ ਅਫਰਿਪਡਾ ਸੈਂਟਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਵਿਗਿਆਨਕਾਂ ਦੇ ਨਾਲ ਓ.ਆਰ.ਪੀ. ਪਿੰਡ ਨੋਪੇ-ਮਾਜਰਾ ਦਾ ਦੌਰਾ ਕੀਤਾ ਅਤੇ ਕਿਸਾਨਾਂ ਨਾਲ ਵਿਚਾਰ-ਵਟਾਂਦਰਾ ਕੀਤਾ। ਇਸ ਦੌਰਾਨ ਪਿੰਡ ਦੇ ਕਿਸਾਨਾਂ ਦੇ ਉਹਨਾਂ ਦਾ ਪਿੰਡ ਵਿੱਚ ਆਉਣ ਤੇ ਨਿੱਘਾ ਸਵਾਗਤ ਕੀਤਾ। ਕਿਸਾਨਾਂ ਵਲੋਂ ਸ. ਸੁਖਵਿੰਦਰ ਸਿੰਘ, ਸ. ਮੋਹਣ ਸਿੰਘ ਅਤੇ ਸ. ਗੁਰਦੀਪ ਸਿੰਘ ਗਰੇਵਾਲ ਨੇ ਆਪਣੇ ਵਿਚਾਰ ਰੱਖੇ ਅਤੇ ਪਿੰਡ ਵਿੱਚ ਇਸ ਸਕੀਮ ਨੂੰ ਚਲਾਉਣ ਲਈ ਪੰਚਾਇਤ ਕੀਤਾ ਅਤੇ ਸਮੰਗਤੀ ਚਿੰਨ ਭੇਂਟ ਕੀਤਾ। ਇਸ ਮੌਕੇ ਤੇ ਡਾ. ਰਾਓ ਨੇ ਸਕੀਮ ਦੇ ਅਧੀਨ ਚੱਲ ਰਹੀ ਵੱਖ-ਵੱਖ ਗਤਿਵਿਧਿਆਂ ਦਾ ਵੇਰਵਾ ਲਿਆ ਅਤੇ ਕਿਸਾਨਾਂ ਨੂੰ ਰੱਖ ਰੱਖ, ਨਰਸਰੀ ਚਲਾਉਣ ਅਤੇ ਸੇਲਫ ਪੁੰਡਜਾਰਿਤ ਕੀਤਾ। ਇਸ ਅਵਸਰ ਤੇ ਡਾ. ਸ਼ਰਮਾ ਨੇ ਵੀ ਆਪਣੇ

ਵਿਚਾਰ ਰੱਖੇ। ਨੂੰ ਡਾ. ਰਾਓ ਨੇ ਪਿੰਡ ਅਚਲਪੁਰ ਅਤੇ ਨੈਨਵਾਂ ਦੇ ਕਿਸਾਨਾਂ ਨਾਲ ਵਿਚਾਰ ਵਟਾਂਦਰਾ ਕੀਤਾ ਅਤੇ ਨਿਕਰਾ ਸਕੀਮ ਅਧੀਨ ਉਥੇ ਚੱਲ ਰਹੇ ਵੱਖ-ਵੱਖ ਤਜਰਬਿਆਂ ਦਾ ਨਿਰੀਖਣ ਕੀਤਾ। ਉਹਨਾਂ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਬਦਲ ਰਹੇ ਮੌਸਮ ਦੇ ਹਾਲਾਤਾਂ ਅਨੁਸਾਰ ਖੇਤੀ ਉਤਪਾਦਕਤਾ ਨੂੰ ਬਰਕਰਾਰ ਰੱਖਣ ਵਾਲੀ ਸੁਧਰੀ ਤਕਨੀਕਾਂ ਨੂੰ ਅਪਣਾਉਣ ਲਈ ਜੋਰ ਦਿੱਤਾ। ਪਿੰਡ ਨੈਨਵਾਂ ਵਿਖੇ ਇਸ ਸਕੀਮ ਅਧੀਨ ਸੋਧੇ ਗਏ ਟੋਭੇ ਦਾ ਨਿਰੀਖਣ ਵੀ ਕੀਤਾ ਉਹਨਾਂ ਨੇ ਇਸ ਮੌਕੇ, ਟੋਭੇ ਦੇ ਪਾਣੀ ਦੀ ਗੁਣਵੱਤਾ ਦੀ ਜਾਂਚ ਕਰਵਾ ਕੇ ਖੇਤੀ ਵਿੱਚ ਵਰਤਣ ਲਈ ਕਿਹਾ। ਇਸ ਮੌਕੇ ਤੇ ਉਹਨਾਂ ਪਿੰਡ ਅਚਲਪੁਰ ਵਿਖੇ ਕਸਟਮ ਹਾਇਰਿੰਗ ਸੈਂਟਰ ਦਾ ਉਦਘਾਟਨ ਕੀਤਾ ਅਤੇ ਕਿਸਾਨਾਂ ਨੂੰ ਇਸ ਸਕੀਮ ਵਿੱਚ ਆਪਣਾ ਯੋਗਦਾਨ ਪਾ ਕੇ ਇਸ ਦਾ ਭਰਪੂਰ ਫਾਇਦਾ ਲੈਣ ਲਈ ਪ੍ਰੇਰਿਆ। ਇਸ ਮੌਕੇ ਤੇ ਪਿੰਡ ਦੀ ਪ੍ਰਧਾਨ ਸ਼ੀਮਤੀ ਸ਼ਰਧਾ ਦੇਵੀ ਨੇ ਪਿੰਡ ਵਿੱਚ ਸਕੀਮ ਚਲਾਉਣ ਲਈ ਧੰਨਵਾਦ ਕੀਤਾ ਅਤੇ ਸਮੰਗਤੀ ਚਿੰਨ ਪ੍ਰਦਾਨ ਕੀਤਾ। ਇਸ ਮੌਕੇ ਤੇ ਸ਼੍ਰੀ ਪਰਮਜੀਤ ਸਿੰਘ, ਸ਼੍ਰੀ ਧਰਵੀਰ ਸਿੰਘ ਨੇ ਨਿਕਰਾ ਸਕੀਮ ਅਧੀਨ ਆਪਣੇ ਖੇਤੀ ਤਜਰਬੇ ਸਾਂਝੇ ਕੀਤੇ। ਇਸ ਮੌਕੇ ਤੇ ਡਾ. ਐਸ.ਸੀ. ਸ਼ਰਮਾ, ਡਾਇਰੈਕਟਰ, ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਨੇ ਡਾ. ਸ਼੍ਰੀਨਿਵਾਸ ਰਾਓ, ਪ੍ਰੋਜੈਕਟ ਕੋਆਰਡੀਨੇਟਰ, ਅਫਰਿਪਡਾ (ਕਜਾਨੀ ਖੇਤੀ) ਅਤੇ ਆਏ ਕਿਸਾਨਾ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ। ਇਸ ਪੂਰੇ ਦੌਰੇ ਵਿੱਚ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਦੇ ਵਿਗਿਆਨੀਆਂ, ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾ, ਡਾ ਵਿਜੈ ਕੁਮਾਰ, ਡਾ. ਰਾਕੇਸ਼ ਕੁਮਾਰ, ਡਾ. ਅਨਿਲ ਖੋਖਰ, ਡਾ. ਯੋਗੇਸ਼ ਖੋਖਰ ਅਤੇ ਡਾ. ਸਰਵਿੰਦਰ ਸਿੰਘ ਨੇ ਵੀ ਜ਼ਿਕਰਯੋਗ ਕੀਤੀ।

ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਵਲੋਂ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਆਯੋਜਿਤ

ਬਲਾਚੌਰ, 17 ਜਨਵਰੀ (ਸੁਭਾਸ ਜੋਸ਼ੀ)

ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਲੋਂ ਨਿਕਰਾ ਪ੍ਰੋਜੈਕਟ ਅਧੀਨ ਆਉਂਦੇ ਪਿੰਡ ਅੱਚਲਪੁਰ ਵਿਖੇ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਕਰਵਾਈ ਗਈ। ਡਾ: ਐਸ. ਐਸ. ਬਾਵਾ, ਭੂਮੀ ਵਿਗਿਆਨੀ ਅਤੇ ਡਾ: ਵਿਵੇਕ ਸ਼ਰਮਾ, ਸਹਾਇਕ ਭੂਮੀ ਵਿਗਿਆਨੀ ਨੇ ਮਿੱਟੀ ਨਿਰੀਖਣ ਸਬੰਧੀ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸੁਚੱਜੀ ਵਰਤੋਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਜਦਕਿ ਸ਼੍ਰੀ ਰਾਕੇਸ਼ ਸ਼ਰਮਾ, ਸਹਾਇਕ ਕੀਟ ਵਿਗਿਆਨੀ ਨੇ ਫਸਲਾਂ ਵਿਚ ਆਉਣ ਵਾਲੇ ਕੀੜੇਆਂ ਦੇ ਹਮਲੇ ਅਤੇ ਉਨ੍ਹਾਂ ਦੀ ਰੋਕਥਾਮ ਕਰਨ ਲਈ ਉਪਰਾਲੇ ਦੱਸੇ ਅਤੇ ਕਣਕ ਦੀ ਪੀਲੀ ਕੁੰਗੀ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਇਸ ਤੋਂ ਇਲਾਵਾ ਇਨ੍ਹਾਂ ਵਿਗਿਆਨੀਆਂ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਵਾਤਾਵਰਣ ਦੇ ਬਦਲਾਓ ਸਬੰਧੀ, ਸੂਰਜੀ ਊਰਜਾ, ਗੋਬਰ ਗੈਸ

ਪਲਾਂਟ, ਤੁਪਕਾ ਅਤੇ ਫੁਆਰਾ ਸਿੰਚਾਈ, ਪੋਲੀ ਅਤੇ ਨੈਟਹਾਉਸ ਬਾਰੇ ਜਾਗਰੂਕ ਕਰਵਾਇਆ ਅਤੇ ਇਨ੍ਹਾਂ ਨੂੰ ਅਪਨਾਉਣ ਬਾਰੇ ਪ੍ਰੇਰਿਤ ਕੀਤਾ ਤਾਂ ਜੋ ਖੇਤੀਬਾੜੀ ਹੋਰ ਲਾਹੇਵੰਦ ਹੋ ਸਕੇ। ਇਸ ਮੌਕੇ ਤੇ ਕਿਸਾਨਾਂ ਨੂੰ ਉਨ੍ਹਾਂ ਦੇ ਖੇਤਾਂ ਦੇ 'ਭੂਮੀ ਸਿਹਤ ਕਾਰਡ' ਵੀ ਵੰਡੇ ਗਏ। ਇਸਦਾ ਮੁੱਖ ਵਿਸ਼ਾ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਦੀ ਕਾਸ਼ਤ ਬਿਮਾਰੀਆਂ ਅਤੇ ਮਿੱਟੀ ਦੀ ਸਿਹਤ ਸੀ। ਇਸ ਗੋਸ਼ਟੀ ਵਿਚ ਸੱਠ ਕਿਸਾਨਾਂ ਨੇ ਭਾਗ ਲਿਆ ਅਤੇ ਫਸਲਾਂ ਦੀਆਂ ਮੁੱਖ ਸਮੱਸਿਆਂਵਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕੀਤੀ। ਜਿਸ ਵਿਚ ਡਾ: ਸੁੱਖਵਿੰਦਰ ਸਿੰਘ, ਸੀਨੀਅਰ ਫਸਲ ਵਿਗਿਆਨੀ ਨੇ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਦੀ ਕਾਸ਼ਤ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਉਨ੍ਹਾਂ ਨੇ ਕਣਕ ਵਿਚ ਨਦੀਨਾਂ ਦੀ ਰੋਕਥਾਮ ਬਾਰੇ ਸ਼ਿਫਾਰਸ਼ ਕੀਤੀਆਂ ਦਵਾਇਆਂ ਦੀ ਵਰਤੋਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ।

8 ਸ਼ੁੱਕਰਵਾਰ, 28 ਮਾਰਚ 2014 ਸਾਂਝਾ ਪੰਨਾ ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ

ਅਗਾਂਹ ਵੱਧੂ ਕਿਸਾਨ ਪਰਮਜੀਤ ਸਿੰਘ ਨੂੰ ਸਨਮਾਨਿਤ ਕੀਤਾ ਗਿਆ

ਗੜਸ਼ੰਕਰ, 27 ਮਾਰਚ (ਅਸ਼ਵਨੀ ਸ਼ਰਮਾ)

ਇੰਡੀਅਨ ਐਸੋਸੀਏਸ਼ਨ ਆਫ ਸੁਆਇਲ ਐਂਡ ਵਾਟਰ ਕੰਜ਼ਰਵੇਸ਼ਨ ਦੇਹਰਾਦੂਨ ਵਿਖੇ ਕਰਵਾਈ ਗਈ "ਫਾਰਮਰਜ਼ ਫਸਟ ਫਾਰ ਕੰਨਜਰਵਿੰਗ ਸੁਆਇਲ ਐਂਡ ਵਾਟਰ ਰਿਸੋਰਸਿਜ਼ ਇੰਨ ਨਾਰਦਨਰੀਜ਼ਨ" ਕਾਨਫਰੰਸ ਵਿਚ ਸ਼੍ਰੀ ਪਰਮਜੀਤ ਸਿੰਘ, ਪਿੰਡ ਅੱਚਲਪੁਰ, ਤਹਿਸੀਲ ਗੜਸ਼ੰਕਰ, ਜਿਲ੍ਹਾ ਹੁਸ਼ਿਆਰਪੁਰ ਨੂੰ ਖੇਤੀ ਵਿਚ ਪਾਣੀ ਅਤੇ ਮਿੱਟੀ ਨੂੰ ਬਚਾਉਣ ਲਈ ਕੀਤੇ ਗਏ ਉਪਰਾਲਿਆਂ ਲਈ ਪ੍ਰਸ਼ੰਸਾ ਪੱਤਰ ਨਾਲ ਸਨਮਾਨਤ ਕੀਤਾ ਗਿਆ ਹੈ। ਇਸ ਕੰਨਫਰੰਸ ਵਿਚ ਪਰਮਜੀਤ ਸਿੰਘ ਨੇ ਵੱਖ ਵੱਖ ਜਗਾ ਤੋਂ ਆਏ ਵਿਗਿਆਨੀਆਂ ਅਤੇ ਅਗਾਂਹ ਵਧੂ ਕਿਸਾਨਾਂ ਸਾਹਮਣੇ ਆਪਣੇ ਖੇਤੀ ਸਬੰਧੀ ਅਨੁਭਵ ਸਾਂਝੇ ਕੀਤੇ। ਉਨ੍ਹਾਂ ਨੇ ਵਰਖਾ ਦੇ ਪਾਣੀ ਦੀ ਸਹੀ ਸਾਂਭ ਸੰਭਾਲ, ਖੇਤ ਦੇ ਪਾਣੀ ਖੇਤ ਵਿਚ ਹੀ ਸੰਭਾਲਣ ਦੇ ਤਰੀਕੇ, ਖਾਦ ਦੀ ਸਦ ਵਰਤੋਂ ਅਤੇ ਘਰ ਵਿਚ ਦਵਾਈਆਂ ਰਹਿਤ ਸਬਜੀਆਂ ਉਗਾਉਣ ਤੇ ਜੋਰ ਪਾਇਆ। ਇਸ ਪ੍ਰਸ਼ੰਸਾ ਪੱਤਰ ਲਈ ਕੰਢੀ ਖੋਜ ਕੇਦਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੁਆਰਾ ਚਲਾਏ ਗਏ ਸਕੀਮ ਦੀ ਸਲਾਘਾ ਕੀਤੀ। ਉਨ੍ਹਾਂ ਨੇ ਦੱਸਿਆ ਕਿ ਡਾ.ਐਸ.ਸੀ. ਸ਼ਰਮਾ, ਨਿਰਦੇਸ਼ਕ, ਕੰਢੀ ਖੋਜ ਕੇਦਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਅਤੇ ਖੋਜ ਕੇਦਰ ਦੇ ਵਿਗਿਆਨੀਆਂ ਦੀਆਂ ਕੋਸ਼ਿਸ਼ਾ ਸਦਕੇ 3 ਸਾਲਾਂ ਤੋਂ ਪਿੰਡ ਵਿਚ ਨਿਕਰਾ ਸਕੀਮ ਚਲਾਈ ਜਾ ਰਹੀ ਹੈ। ਜਿਸ ਦੇ ਨਾਲ ਕਿਸਾਨਾਂ ਨੂੰ ਬਰਸਾਤੀ ਪਾਣੀ ਦਾ ਇਕੱਠ ਅਤੇ ਸੁਚੱਜੀ ਵਰਤੋਂ, ਬਰਾਨੀ ਖੇਤੀ ਨੂੰ ਲਾਹੇਵੰਦ ਬਣਾਉਣ ਲਈ ਤਕਨੀਕਾਂ ਅਤੇ ਸੋਧਾਂ ਮਿਲੀਆਂ ਹਨ ਖੇਤੀ ਵਿਚ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਉਨ੍ਹਾਂ ਦੇ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਹੋਣ ਕਾਰਣ ਪੈਦਾਵਾਰ ਵਿਚ ਕਾਫੀ ਵਾਧਾ ਹੋਇਆ ਹੈ। ਪਿੰਡ ਵਿਚ ਚਲਾਈ ਜਾ ਰਹੀ ਖੇਤੀ ਸਬੰਧੀ ਅੰਜਾਰਾਂ ਦੀ ਸਾਂਝੀ ਵਰਤੋਂ ਲਈ ਕਸਟਮ ਹਾਇਰਿੰਗ ਸਕੀਮ ਕਿਸਾਨਾਂ ਲਈ ਬਹੁਤ ਹੀ ਲਾਹੇਵੰਦ ਸਿੱਧ ਹੋਈ ਹੈ। ਉਨ੍ਹਾਂ ਨੇ ਕੰਢੀ ਦੇ ਕਿਸਾਨਾਂ ਨੂੰ ਅਪੀਲ ਕੀਤੀ ਕਿ ਉਹ ਖੇਤੀ ਨੂੰ ਲਾਹੇਵੰਦ ਬਣਾਉਣ ਲਈ ਵਿਗਿਆਨੀ ਢੰਗ ਨਾਲ ਖੇਤੀ ਕਰਨ ਅਤੇ

ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਸੰਸਥਾਨਾਂ ਨਾਲ ਜੁੜ ਕੇ ਵੱਧ ਤੋਂ ਵੱਧ ਫਾਇਦਾ ਉਠਾਉਣ। ਕੰਢੀ ਖੋਜ ਕੇਦਰ, ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਡਾ. ਸ਼ਰਮਾਂ ਅਤੇ ਹੋਰ ਵਿਗਿਆਨੀਆ ਨੇ ਸ਼੍ਰੀ ਪਰਮਜੀਤ ਸਿੰਘ ਨੂੰ ਇਸ ਸਨਮਾਨ ਲਈ ਵਧਾਈ ਦਿੱਤੀ ਅਤੇ ਉਮੀਦ ਕੀਤੀ ਕਿ ਬਾਕੀ ਕਿਸਾਨ ਵੀ ਇਸੇ ਤਰ੍ਹਾਂ ਵੱਧ ਤੋਂ ਵੱਧ ਫਾਇਦਾ ਲੈ ਕੇ ਕੁਦਰਤੀ ਸੋਮਿਆਂ ਨੂੰ ਬਚਾ ਕੇ ਪੈਦਾਵਾਰ ਵਧਾ ਸਕਣ।

ਖੇਤੀ ਮਾਹਿਰਾਂ ਵੱਲੋਂ ਇਕ ਦਿਨਾ ਜਾਗਰੂਕਤਾ ਕੈਂਪ

ਪਿੰਡ ਨੰਧੋਮਾਜਰਾ ਵਿਖੇ ਲਗਾਏ ਗਏ ਖੇਤੀ ਜਾਗਰੂਕਤਾ ਕੈਂਪ ਦੌਰਾਨ ਡਾ: ਅਪੂਰਵਾ ਜਗੀ, ਡਾ: ਵਿਵੇਕ ਤੇ ਡਾ: ਰਾਕੇਸ਼ ਸ਼ਰਮਾ ਸੁਆਣੀਆਂ ਨੂੰ ਜਾਣਕਾਰੀ ਦਿੰਦੇ ਹੋਏ। ਤਸਵੀਰ: ਦੀਦਾਰ ਸਿੰਘ ਬਲਾਚੌਰੀਆ

ਬਲਾਚੌਰ, 23 ਅਗਸਤ (ਦੀਦਾਰ ਸਿੰਘ ਬਲਾਚੌਰੀਆ)– ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ (ਬਲਾਚੌਰ) ਵੱਲੋਂ ਕ੍ਰਿਸ਼ੀ ਵਿਗਿਆਨ ਕੇਂਦਰ ਰੂਪਨਗਰ ਦੇ ਸਹਿਯੋਗ ਨਾਲ ਪਿੰਡ ਨੰਧੋ ਮਾਜਰਾ (ਨੰਜੇ ਨੂਰਪੁਰ ਬੇਦੀ) ਵਿਖੇ ਖੇਤੀ ਉਪਜ ਦੀ ਉਪਯੋਗਤਾ ਵਧਾਉਣ ਲਈ ਔਰਤਾਂ ਦਾ ਇਕ ਦਿਨਾ ਜਾਗਰੂਕਤਾ ਕੈਂਪ ਕਰਵਾਇਆ ਗਿਆ, ਜਿਸ ਵਿਚ ਆਚਾਰ ਚਟਣੀ ਬਣਾਉਣ ਸਬੰਧੀ ਸਿਖਲਾਈ ਅਤੇ ਖੁਰਾਕੀ ਤੱਤਾਂ ਦੇ ਪੌਸ਼ਣ ਪ੍ਰਤੱਖ ਦਰਸਾਈ। ਇਸ ਤੋਂ ਇਲਾਵਾ ਦੁੱਧ ਦੀ ਫਿਰਨੀ ਅਤੇ ਪੁਡਿੰਗ ਵੀ ਬਣਾ ਕੇ ਦਿਖਾਈ। ਇਸ ਮੌਕੇ ਡਾ: ਕਿਰਨਦੀਪ ਕੌਰ, ਅਸਿਸਟੈਂਟ ਪ੍ਰੋਫੈਸਰ (ਫਲ ਵਿਗਿਆਨ) ਨੇ ਕੇ. ਵੀ. ਕੇ. ਦੁਆਰਾ ਚਲਾਏ ਜਾ ਰਹੇ ਵੱਖ-ਵੱਖ ਸਿਖਲਾਈ ਕੋਰਸਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿੱਤੀ। ਇਸ ਮੌਕੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਵੱਲੋਂ ਡਾ: ਰਾਕੇਸ਼ ਸ਼ਰਮਾ, ਅਸਿਸਟੈਂਟ ਐਂਟੋਮੋਲੋਜਿਸਟ ਅਤੇ ਡਾ: ਵਿਵੇਕ ਸ਼ਰਮਾ ਅਸਿਸਟੈਂਟ ਸੋਇਲ ਕੈਮਿਸਟ ਨੇ ਅਜਿਹੇ ਜਾਗਰੂਕ ਕੈਂਪਾਂ ਦੀ ਸਾਰਥਿਕਤਾ ਅਤੇ ਮਹੱਤਤਾ ਬਾਰੇ ਰੌਸ਼ਨੀ ਪਾਈ ਅਤੇ ਖੇਤੀ ਮਾਹਿਰਾਂ ਨੇ 4 ਸਤੰਬਰ ਨੂੰ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿਖੇ ਲੱਗ ਰਹੇ ਕਿਸਾਨ ਮੇਲੇ ਵਿਚ ਵੱਧ ਚੜ ਕੇ ਸ਼ਾਮਿਲ ਹੋਣ ਲਈ ਸੱਦਾ ਵੀ ਦਿੱਤਾ। ਅੰਤ 'ਚ ਕਿਸਾਨ ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਨੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਅਤੇ ਕ੍ਰਿਸ਼ੀ ਵਿਗਿਆਨ ਕੇਂਦਰ ਰੂਪਨਗਰ ਦੇ ਖੇਤੀ ਮਾਹਿਰਾਂ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ।

ROJANA SPOKESMAN 11.03.2014

ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਟੀ ਨੇ ਲਾਇਆ ਕਿਸਾਨ ਮੇਲਾ

ਕੰਢੀ ਖੇਤਰ 'ਚ ਫਲਾਂ ਦੀ ਖੇਤੀ ਲਈ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ ਹਨ : ਆਹਲੂਵਾਲੀਆ

ਨਵਾਂ ਸ਼ਹਿਰ, 10 ਮਾਰਚ (ਜਤਿੰਦਰ ਪਾਲ ਸਿੰਘ) : ਪੰਜਾਬ ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਮਾਰਚ ਮਹੀਨੇ ਵਿਚ ਆਯੋਜਿਤ ਕੀਤੇ ਜਾਣ ਵਾਲੇ ਕਿਸਾਨ ਮੇਲਿਆਂ ਦੀ ਲੜੀ ਵਿਚੋਂ ਤੀਜਾ ਕਿਸਾਨ ਮੇਲਾ ਕੰਢੀ ਖੇਤਰ ਦੇ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ, ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਨਗਰ ਵਿਖੇ ਅੱਜ ਲਗਾਇਆ ਗਿਆ। ਅਗਾਂਹ ਵਧੂ ਫ਼ਲ ਉਤਪਾਦਕ ਅਤੇ ਯੂਨੀਵਰਸਟੀ ਦੇ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਦੇ ਮੈਂਬਰ ਕੁਲਵੰਤ ਸਿੰਘ ਆਹਲੂਵਾਲੀਆ ਨੇ ਇਸ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕੀਤਾ ਜਦਕਿ ਯੂਨੀਵਰਸਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਉਦਘਾਟਨੀ ਸਮਾਰੋਹ ਦੀ ਪ੍ਰਧਾਨਗੀ ਕੀਤੀ।

ਇਸ ਮੌਕੇ ਸ. ਆਹਲੂਵਾਲੀਆ ਨੇ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਭਾਰਤ ਦੀ ਖੇਤੀ ਨਾਲ ਦੇਸ਼ ਦੀ ਕੁੱਲ 60 ਫ਼ੀ ਸਦੀ ਆਬਾਦੀ ਸਬੰਧਤ ਹੈ ਜਦਕਿ ਕੁੱਲ ਦੇਸ਼ ਦੀ ਆਮਦਨ ਦਾ 14% ਹਿੱਸਾ ਹੀ ਇਸ ਪਾਸੋਂ ਆਉਂਦਾ ਹੈ। ਯੂਨੀਵਰਸਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਇਸ ਮੌਕੇ ਕਿਸਾਨਾਂ ਨੂੰ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਕਿਸਾਨ ਹੀ ਅਪਣੇ ਆਪ ਵਿਚ ਸਾਇੰਸਦਾਨ ਹੁੰਦਾ ਹੈ । ਇਨ੍ਹਾਂ ਕਿਸਾਨ ਮੇਲਿਆਂ ਤੋਂ ਕਿਸਾਨ ਸਾਇੰਸਦਾਨਾਂ ਤੋਂ ਕੁਝ ਸਿੱਖਦੇ ਹਨ ਅਤੇ ਕਿਸਾਨਾਂ ਵਲੋਂ ਪ੍ਰਦਾਨ ਕੀਤੀ ਸੂਚਨਾ ਨਵੀਆਂ ਖੋਜਾਂ ਦਾ ਮੁੱਢ ਬੱਝਦੀ ਹੈ। ਡਾ. ਢਿੱਲੋਂ ਨੇ ਦਸਿਆ ਕਿ ਇਸ ਵਾਰ ਕਿਸਾਨ ਮੇਲੇ ਦਾ ਮੁੱਖ ਉਦੇਸ਼ ਬੇਲੋੜੇ ਰਸਾਇਣਾਂ ਉਪਰ ਖ਼ਰਚਾ ਘਟਾਉ, ਵਾਤਾਵਰਣ ਬਚਾਉ ਮੁਨਾਫ਼ਾ ਵਧਾਉ ਰੱਖਿਆ ਗਿਆ ਹੈ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਕੰਢੀ ਖੇਤਰ ਵਿਚ ਫ਼ਲਾਂ ਦੀ ਖੇਤੀ ਕਰਨ ਦੀ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ ਹਨ।

ਇਸ ਤੋਂ ਪਹਿਲਾਂ ਯੂਨੀਵਰਸਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਖੋਜ ਡਾ. ਸਤਿਬੀਰ ਸਿੰਘ ਗੋਸਲ ਨੇ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਕੀਤੇ ਜਾ ਰਹੇ ਖੋਜ ਕਾਰਜਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕੀਤੀ । ਯੂਨੀਵਰਸਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਪਸਾਰ ਸਿਖਿਆ ਡਾ. ਹਰਵਿੰਦਰ ਸਿੰਘ ਧਾਲੀਵਾਲ ਨੇ ਜੀ ਆਇਆਂ ਦੇ ਸ਼ਬਦ ਬੋਲਦਿਆਂ ਕਿਹਾ ਕਿ ਇਨ੍ਹਾਂ ਕਿਸਾਨ ਮੇਲਿਆਂ ਵਿਚ ਯੂਨੀਵਰਸਟੀ ਵਲੋਂ ਵਿਕਸਤ ਕੀਤੀਆਂ ਗਈਆਂ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਤਕਨਾਲੌਜੀਆਂ ਪ੍ਰਦਰਸ਼ਤ ਕੀਤੀਆਂ ਜਾਂਦੀਆਂ ਹਨ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਯੂਨੀਵਰਸਟੀ ਦੀਆਂ ਪ੍ਰਕਾਸ਼ਨਾਵਾਂ ਦੇ ਨਾਲ ਜੁੜ ਕੇ ਅਸੀਂ ਅਪਣੀ ਖੇਤੀ ਦੀ ਨੁਹਾਰ ਬਦਲ ਸਕਦੇ ਹਾਂ। ਅੰਤ ਵਿਚ ਧਨਵਾਦ ਦੇ ਸ਼ਬਦ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਦੇ ਡਾਇਰੈਕਟਰ ਡਾ. ਐਸ.ਸੀ. ਸ਼ਰਮਾ ਨੇ ਕਹੇ । ਇਸ ਮੌਕੇ ਯੂਨੀਵਰਸਟੀ ਦੇ ਵੱਖ ਵੱਖ ਵਿਭਾਗਾਂ ਵਲੋਂ ਪ੍ਰਦਰਸ਼ਨੀਆਂ ਵੀ ਲਗਾਈਆਂ ਗਈਆਂ । ਕਿਸਾਨਾਂ ਦੇ ਸਵਾਲਾਂ ਦੇ ਜਵਾਬ ਵੱਖ ਵੱਖ ਵਿਸ਼ਿਆਂ ਵਸਤੂਆਂ ਮਾਹਰਾਂ ਵਲੋਂ ਵੀ ਦਿਤੇ ਗਏ ।

Punjabi Tribune (Doaba) dated 11.03.2014

ਖੇਤੀਬਾੜੀ ਨਾਲ ਸਹਾਇਕ ਧੰਦੇ ਅਪਣਾਉਣੇ ਸਮੇਂ ਦੀ ਲੋੜ: ਆਹਲੂਵਾਲੀਆ

ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿੱਚ ਕਿਸਾਨ ਮੇਲਾ

ਸੁਭਾਸ਼ ਜੋਸ਼ੀ

ਬਲਾਚੌਰ, 10 ਮਾਰਚ

ਪੰਜਾਬ ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਅੱਜ ਤੀਜਾ ਕਿਸਾਨ ਮੇਲਾ ਕੰਢੀ ਖੇਤਰ ਦੇ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ, ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਨਗਰ ਵਿੱਚ ਲਗਾਇਆ ਗਿਆ। ਅਗਾਂਹਵਧੂ ਫਲ ਉਤਪਾਦਕ ਅਤੇ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਦੇ ਮੈਂਬਰ ਕੁਲਵੰਤ ਸਿੰਘ ਆਹਲੂਵਾਲੀਆ ਨੇ ਇਸ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕੀਤਾ ਜਦਕਿ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਸਮਾਰੋਹ ਦੀ ਪ੍ਰਧਾਨਗੀ ਕੀਤੀ।

ਇਸ ਮੌਕੇ ਸ੍ਰੀ ਆਹਲੂਵਾਲੀਆ ਨੇ ਕਿਹਾ ਕਿ ਭਾਰਤ ਦੀ ਖੇਤੀ ਨਾਲ ਦੇਸ਼ ਦੀ ਕੁੱਲ 60 ਫੀਸਦੀ ਆਬਾਦੀ ਸਬੰਧਤ ਹੈ ਜਦਕਿ ਕੁੱਲ ਦੇਸ਼ ਦੀ ਆਮਦਨ ਦਾ 14 ਫੀਸਦੀ ਹਿੱਸਾ ਹੀ ਇਸ ਪਾਸੋਂ ਆਉਂਦਾ ਹੈ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਸਾਨੂੰ ਅਨਾਜ ਪੈਦਾ ਕਰਨ ਦੇ ਨਾਲ-ਨਾਲ ਫਲਾਂ ਦੀ ਖੇਤੀ ਵੱਲ ਵੀ ਧਿਆਨ ਦੇਣਾ ਚਾਹੀਦਾ ਹੈ ਤਾਂ ਜੋ ਅਸੀਂ ਆਪਣੇ ਕਿਸਾਨ ਭਰਾਵਾਂ ਦੀ ਆਰਥਿਕ ਹਾਲਤ ਵਿੱਚ ਸੁਧਾਰ ਕਰ ਸਕੀਏ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਇਸ ਨਾਲ ਜਿੱਥੇ ਸਾਡੇ ਕਿਸਾਨ ਭਰਾਵਾਂ ਦੀ ਆਰਥਿਕ ਹਾਲਤ ਵਿੱਚ ਸੁਧਾਰ ਹੋਵੇਗਾ, ਉਥੇ ਹੀ ਸਾਡੇ ਦੇਸ਼ ਦੀ ਆਰਥਿਕਤਾ ਵੀ ਮਜ਼ਬੂਤ ਹੋਵੇਗੀ।

ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਕਿਹਾ ਕਿ ਕਿਸਾਨ ਹੀ ਅਪਣੇ ਆਪ ਵਿੱਚ ਸਾਇੰਸਦਾਨ ਹੁੰਦਾ ਹੈ। ਇਨ੍ਹਾਂ ਕਿਸਾਨ ਮੇਲਿਆਂ ਤੋਂ ਕਿਸਾਨ ਸਾਇੰਸਦਾਨਾਂ ਤੋਂ ਕੁਝ ਸਿੱਖਦੇ ਹਨ ਅਤੇ ਕਿਸਾਨਾਂ ਵੱਲੋਂ ਪ੍ਰਦਾਨ ਕੀਤੀ ਸੂਚਨਾ ਨਾਲ ਨਵੀਆਂ ਖੋਜਾਂ ਦਾ ਮੁੱਢ ਬੱਝਦਾ ਹੈ। ਉਨ੍ਹਾਂ ਕਿਹਾ ਕਿ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਵਿਕਸਤ ਕੀਤੀਆਂ ਗਈਆਂ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਤਕਨਾਲੌਜੀਆਂ ਨੂੰ ਇਸ ਮੇਲੇ ਦੌਰਾਨ ਪ੍ਰਦਰਸ਼ਤ ਕੀਤਾ ਜਾਂਦਾ ਹੈ।

ਇਸ ਮੌਕੇ ਡਾ. ਰਾਕੇਸ਼ ਸ਼ਰਮਾ, ਅਸਿਸਟੈਂਟ ਐਂਟੋਮੋਲੋਜਿਸਟ ਅਤੇ ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾ ਅਸਿਸਟੈਂਟ ਸੋਇਲ ਕੈਮਿਸਟ ਨੇ ਅਜਿਹੇ ਜਾਗਰੂਕ ਕੈਂਪਾਂ ਦੀ ਸਾਰਥਿਕਤਾ ਅਤੇ ਮਹੱਤਤਾ ਬਾਰੇ ਰੌਸ਼ਨੀ ਪਾਈ ਅਤੇ ਖੇਤੀ ਮਾਹਿਰਾਂ ਨੇ 4 ਸਤੰਬਰ ਨੂੰ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਵਿਖੇ ਲੱਗ ਰਹੇ ਕਿਸਾਨ ਮੇਲੇ ਵਿਚ ਵੱਧ ਚੜ ਕੇ ਸ਼ਾਮਿਲ ਹੋਣ ਲਈ ਸੱਦਾ ਵੀ ਦਿੱਤਾ। ਅੰਤ 'ਚ ਕਿਸਾਨ ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਨੇ ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਅਤੇ ਕ੍ਰਿਸ਼ੀ ਵਿਗਿਆਨ ਕੇਂਦਰ ਰੂਪਨਗਰ ਦੇ ਖੇਤੀ ਮਾਹਿਰਾਂ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ।

ਕਿਸਾਨ ਮੇਲੇ ਵਿੱਚ ਪਹੁੰਚੇ ਮਹਿਮਾਨ ਖੇਤੀਬਾੜੀ ਸਬੰਧੀ ਵਿੱਚ ਪ੍ਰਦਰਸ਼ਨੀ ਦੇਖਦੇ ਹੋਏ।

3 ਵੀਰਵਾਰ, 21 ਮਾਰਚ 2013 ਪੰਜਾਬ ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ

ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਦਾ ਉਤਪਾਦਨ, ਸੁਰੱਖਿਆ ਅਤੇ ਮਿਟੀ-ਪਾਣੀ ਦੀ ਸੰਭਾਲ ਬਾਰੇ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਦਾ ਆਯੋਜਨ

ਬਲਾਚੌਰ, 20 ਮਾਰਚ (ਸੁਭਾਸ਼ ਜੋਸ਼ੀ)

ਅੱਜ ਡਾ. ਐਸ. ਸੀ. ਸ਼ਰਮਾ, ਨਿਰਦੇਸ਼ਕ, ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ (ਪੀ. ਏ. ਯੂ) ਬੱਲੋਵਾਲ ਸੌਖੜੀ ਦੀ ਪ੍ਰਧਾਨਗੀ ਹੇਠ ਪਿੰਡ ਨੰਧੋ ਮਾਜਰਾ ਵਿਚ ਓਪਰੇਸ਼ਨਲ ਰਿਸਰਚ ਪ੍ਰੋਜੈਕਟ (ਓ. ਆਰ. ਪੀ.) ਦੇ ਅਧੀਨ ਇੱਕ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਦਾ ਆਯੋਜਨ ਕੀਤਾ ਗਿਆ। ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਵਿਚ 45 ਕਿਸਾਨ ਵੀਰਾਂ ਨੇ ਭਾਗ ਲਿਆ। ਜਿਸ ਵਿਚ ਡਾ. ਐਸ. ਸੀ. ਸ਼ਰਮਾ, ਨਿਰਦੇਸ਼ਕ, ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਫਸਲ ਵਣਜੀਕੀ, ਫਸਲ-ਬਾਗਬਾਨੀ, ਗੋਬਰ ਗੈਸ ਅਤੇ ਸੁਰਜੀ ਉਰਜ਼ਾ ਨੂੰ ਅਪਨਾਉਣ ਦੀ ਪ੍ਰੇਰਣਾ ਦਿਤੀ । ਉਨ੍ਹਾਂ ਨੇ ਪਿੰਡ ਵਿਚ ਇੱਕ ਪਸ਼ੂ ਡਾਕਾਈ ਕੈਂਪ ਅਤੇ ਅਚਾਰ-ਚਟਣੀ ਦੀ ਟਰੇਨਿੰਗ ਦਾ ਆਯੋਜਨ ਕਰਵਾਉਣ ਦਾ ਭਰੋਸਾ ਦਿੱਤਾ । ਡਾ. ਸ਼ੁਖਵਿੰਦਰ ਸਿੰਘ, ਸੀ. ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਫਸਲ-ਵਿਭਿੰਨਤਾ ਸੰਬਧੀ ਜਾਣਕਾਰੀ ਦਿੱਤੀ । ਕਿਸਾਨਾਂ ਨੂੰ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਉਨੱਤ ਬੀਜਾਂ ਰਾਹੀ ਖੇਤੀ ਕਰਕੇ ਘੱਟ ਖ਼ਰਚੇ ਨਾਲ ਵੱਧ ਉਤਪਾਦਨ ਲੈਣ ਦੀ ਸਲਾਹ ਦਿੱਤੀ । ਡਾ. ਐਸ. ਐਸ. ਬਾਵਾ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਫਸਲਾਂ ਵਿਚ ਪਾਣੀ ਦੀ ਸਦਵਰਤੋਂ, ਮਿੱਟੀ ਪ੍ਰੀਖਣ ਦੇ ਲਾਭਾਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸਹੀ ਵਰਤੋਂ ਲਈ ਜਾਗਰੂਕ ਕੀਤਾ । ਉਨ੍ਹਾਂ ਨੇ ਕਿਹਾ ਕਿ ਖੇਤ ਦੀ ਮਿੱਟੀ ਦਾ ਪ੍ਰੀਖਣ ਕਰਵਾ ਕੇ ਯੂਨੀਵਰਸਿਟੀ ਵਲੋਂ ਕੀਤੀ ਗਈ ਸਿਫਾਰਸ ਅਨੁਸਾਰ ਹੀ ਖਾਦਾਂ ਦੀ ਵਰਤੋਂ ਕੀਤੀ ਜਾਵੇ। ਸ਼੍ਰੀ ਰਾਕੇਸ਼ ਕੁਮਾਰ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਐਨਟੋਮੋਲੋਜਿਸਟ ਨੇ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਵਿਚ ਆਉਣ ਵਾਲੀਆਂ ਬਿਮਾਰੀਆਂ ਅਤੇ ਕੀੜੇਆਂ ਬਾਰੇ ਆਪਣੇ ਵਿਚਾਰ ਸਾਂਝੇ ਕੀਤੇ ।ਕਿਸਾਨਾਂ ਨੇ ਫਲਦਾਰ ਬੂਟਿਆਂ ਨੂੰ ਹੋਣ ਵਾਲੀਆਂ ਬੀਮਾਰੀਆਂ ਬਾਰੇ ਆਪਣੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ, ਜਿਨ੍ਹਾਂ ਦਾ ਵਿਗਿਆਨੀਆਂ ਨੇ ਮੌਕੇ ਤੇ ਹੀ ਸਮਾਧਾਨ ਕੀਤਾ ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਸਾਇਲ ਕਮਿਸਟ ਨੇ ਜੈਵਿਕ ਖੇਤੀ ਬਾਰੇ ਨਵੀਨਤਮ ਜਾਣਕਾਰੀ ਦਿੱਤੀ ਡਾ. ਅਨਿਲ ਕੁਮਾਰ ਖੋਖਰ, ਅਸਿਸਟੈਂਟ ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕੰਢੀ ਖੇਤਰ ਵਿਚ ਜੱਲ ਤੇ ਮਿੱਟੀ ਬਚਾਓ ਬਾਰੇ ਕਿਸਾਨਾਂ ਨੂੰ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕੀਤੀ। ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਉਪਰੰਤ ਵੱਖ-2 ਤਜੁਰਬਿਆਂ ਦਾ ਨਿਰੀਖਣ ਕੀਤਾ ਅਤੇ ਮੌਕੇ ਤੇ ਕਿਸਾਨਾਂ ਦੇ ਸੁਆਲਾਂ ਦਾ ਜਵਾਬ ਅਤੇ ਸੁਝਾਉ ਦਿੱਤੇ। ਪਿੰਡ ਦੇ ਸਰਪੰਚ ਮੋਹਣ ਲਾਲ, ਸਰਦਾਰ ਸੁੱਖਵਿੰਦਰ ਸਿੰਘ ਅਤੇ ਸਰਦਾਰ ਮੋਹਣ ਸਿੰਘ ਦਮਾਨਾ ਨੇ ਇਸ ਮੌਕੇ ਤੇ ਸ਼ਾਮਿਲ ਹੋਏ ਕਿਸਾਨ ਵੀਰਾਂ ਬੀਬੀਆਂ ਅਤੇ ਮਾਹਿਰਾਂ ਦਾ ਦਿਲੀ ਧੰਨਵਾਦ ਕੀਤਾ।

PUNJABI JAGRAN DATED 12.03.2014

ਕੰਢੀ ਖੇਤਰ 'ਚ ਫ਼ਲਾਂ ਦੀ ਖੇਤੀ 'ਚ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ : ਆਹਲੂਵਾਲੀਆ

ਉਪਰਾਲਾ

- ਪੰਜਾਬ ਐਗਰੀਕਲਚਰਲ ਯੂਨੀਵਰਸਿਟੀ ਨੇ ਬੱਲੋਵਾਲ ਸੌਂਖੜੀ ਵਿਖੇ ਕਿਸਾਨ ਮੇਲਾ ਲਗਾਇਆ

ਵਰਿੰਦਰ ਹੁੰਦਲ, ਬਲਾਚੌਰ

ਬਲਾਚੌਰ ਵਿਖੇ ਪੰਜਾਬ ਐਗਰੀਕਲਚਰਲ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਲਗਾਏ ਕਿਸਾਨ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕਰਦੇ ਹੋਏ ਮੁੱਖ ਮਹਿਮਾਨ। ਪੰਜਾਬੀ ਜਾਗਰਣ

ਪੰਜਾਬ ਖੇਤੀਬਾੜੀ ਯੂਨੀਵਰਸਿਟੀ ਵੱਲੋਂ ਮਾਰਚ ਮਹੀਨੇ 'ਚ ਕਰਵਾਏ ਜਾਣ ਵਾਲੇ ਕਿਸਾਨ ਮੇਲਿਆਂ ਦੀ ਲੜੀ 'ਚੋਂ ਤੀਜਾ ਕਿਸਾਨ ਮੇਲਾ ਕੰਢੀ ਖੇਤਰ ਦੇ ਖੇਤਰੀ ਖੋਜ ਕੇਂਦਰ ਬੱਲੋਵਾਲ ਸੌਖੜੀ, ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਨਗਰ ਵਿਖੇ ਲਗਾਇਆ ਗਿਆ। ਅਗਾਂਹ ਵਧੂ ਫ਼ਲ ਉਤਪਾਦਕ ਤੇ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਪ੍ਰਬੰਧਕੀ ਬੋਰਡ ਦੇ ਮੈਂਬਰ ਕੁਲਵੰਤ ਸਿੰਘ ਆਹਲੂਵਾਲੀਆ ਨੇ ਇਸ ਮੇਲੇ ਦਾ ਉਦਘਾਟਨ ਕੀਤਾ ਜਦਕਿ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਸਮਾਰੋਹ ਦੀ ਪ੍ਰਧਾਨਗੀ ਕੀਤੀ। ਇਸ ਮੌਕੇ ਆਹਲੂਵਾਲੀਆ ਨੇ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਭਾਰਤ ਦੀ ਖੇਤੀ ਨਾਲ ਦੇਸ਼ ਦੀ ਕੁੱਲ 60 ਫੀਸਦੀ ਆਬਾਦੀ ਸੰਬੰਧਤ ਹੈ ਜਦਕਿ ਕੁੱਲ ਦੇਸ਼ ਦੀ ਆਮਦਨ ਦਾ 14% ਹਿੱਸਾ ਹੀ ਇਸ ਪਾਸੋਂ ਆਉਂਦਾ ਹੈ। ਕੰਢੀ ਦੇ ਖੇਤਰ ਵਿੱਚ ਫ਼ਲ ਉਤਪਾਦਨ ਵਿੱਚ ਅਥਾਹ ਸੰਭਾਵਨਾਵਾਂ ਹਨ। ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਵਾਈਸ ਚਾਂਸਲਰ ਡਾ. ਬਲਦੇਵ ਸਿੰਘ ਢਿੱਲੋਂ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਸੰਬੋਧਨ ਕਰਦਿਆਂ ਕਿਹਾ ਕਿ ਕਿਸਾਨ ਹੀ ਆਪਣੇ ਆਪ ਵਿੱਚ ਸਾਇੰਸਦਾਨ ਹੁੰਦਾ ਹੈ। ਇਸ ਤੋਂ ਪਹਿਲਾਂ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਨਿਰਦੇਸ਼ਕ ਖੋਜ ਡਾ. ਸਤਿਬੀਰ ਸਿੰਘ ਗੋਸਲ ਨੇ ਯੂਨੀਵਰਸਿਟੀ ਵਲੋਂ ਕੀਤੇ ਜਾ ਰਹੇ ਖੋਜ ਕਾਰਜਾਂ ਬਾਰੇ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕੀਤੀ। ਯੂਨੀਵਰਸਿਟੀ ਵਲੋਂ ਬੀਤੇ ਦਿਨੀਂ ਝੋਨੇ ਦੀ ਨਵੀਂ ਕਿਸਮ ਪੀ ਆਰ 123 ਤੋਂ ਇਲਾਵਾ ਪੂਸਾ ਪੰਜਾਬ ਬਾਸਮਤੀ 1509, ਗੰਨੇ ਦੀ ਸੀਓਪੀਬੀ 91, ਸੋਇਆਬੀਨ ਦੀ ਐਸਐਲ 958, ਦੇਸੀ ਨਰਮੇ ਦੀ ਕਿਸਮ ਐਫਐਮਡੀਐਚ 9, ਮੱਕੀ ਦੀ ਦੋਗਲੀ ਕਿਸਮ ਪੀਐਮਐਚ 8, ਮੰਥੇ ਦੀ ਕਿਸਮ ਕੋਸੀ, ਪਪੀਤੇ ਦੀ ਰੈਡ ਲੇਡੀ 786 ਅਤੇ ਅਨਾਰ ਦੀ ਭਗਵਾ ਜਾਰੀ ਕੀਤੀ ਗਈ ਹੈ। ਇਸ ਮੌਕੇ ਯੂਨੀਵਰਸਿਟੀ ਦੇ ਵੱਖ ਵੱਖ ਵਿਭਾਗਾਂ ਵੱਲੋਂ ਪ੍ਰਦਰਸ਼ਨੀਆਂ ਵੀ ਲਗਾਈਆਂ ਗਈਆਂ। ਕਿਸਾਨਾਂ ਦੇ ਸਵਾਲਾਂ ਦੇ ਜਵਾਬ ਵੱਖ-ਵੱਖ ਵਿਸ਼ਿਆਂ ਵਸਤੂਆਂ ਮਾਹਿਰਾਂ ਵੱਲੋਂ ਵੀ ਦਿੱਤੇ ਗਏ।

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3 ਵੀਰਵਾਰ, 14 ਮਾਰਚ 2013 **ਪੰਜਾਬ** ਦਾ ਟਾਈਮਜ਼ ਆਫ਼ ਪੰਜਾਬ

ਖੇਤੀਬਾੜੀ ਵਿਭਾਗ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਕੀਤਾ ਜਾਗਰੂਕ

ਬਲਾਚੌਰ, 13 ਮਾਰਚ
(ਸੁਭਾਸ਼ ਜੋਸ਼ੀ)

ਡਾ. ਐਸ. ਸੀ. ਸ਼ਰਮਾ, ਨਿਰਦੇਸ਼ਕ, ਕੰਢੀ ਖੋਜ ਕੇਂਦਰ (ਪੀ. ਏ. ਯੂ) ਬੱਲੋਵਾਲ ਸੌਂਖੜੀ ਦੇ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ ਹੇਠ ਪਿੰਡ ਨੈਣਵਾਂ, ਤਹਿਸੀਲ ਗੜਸ਼ੰਕਰ ਵਿਚ ਵਲੋਂ ਇੱਕ ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਦਾ ਆਯੋਜਨ ਕੀਤਾ ਗਿਆ। ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਵਿਚ ੪੫ ਕਿਸਾਨ ਵੀਰਾਂ ਨੇ ਭਾਗ ਲਿਆ ਜਿਸ ਵਿਚ ਡਾ. ਸ਼ੁਖਵਿੰਦਰ ਸਿੰਘ, ਸੀ. ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਤੇਲ ਬੀਜਾਂ ਦੀਆਂ ਫਸਲਾਂ ਸੰਬਧੀ ਜਾਣਕਾਰੀ ਦਿੱਤੀ । ਉਨ੍ਹਾਂ ਨੇ ਦਸਿਆ ਕਿ ਪਸ਼ੂਆਂ ਵਲੋਂ ਫਸਲਾਂ ਨੂੰ ਨੁਕਸਾਨ ਹੋਣ ਵਾਲੀ ਜਗ੍ਹਾ ਤੇ ਤਾਰਾਮੀਰਾ ਲਗਾਇਆ ਜਾ ਸਕਦਾ ਹੈ । ਕਿਸਾਨਾਂ ਨੂੰ ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਅਤੇ ਉਨੱਤ ਬੀਜਾਂ ਰਾਹੀਂ ਖੇਤੀ ਕਰਕੇ ਘੱਟ ਖਰਚੇ ਨਾਲ ਵੱਧ ਉਤਪਾਦਨ ਲੈਣ ਦੀ ਸਲਾਹ ਦਿੱਤੀ । ਸ਼੍ਰੀ ਰਾਕੇਸ਼ ਕੁਮਾਰ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਐਨਟੋਮੋਲੋਜਿਸਟ ਨੇ ਹਾੜੀ ਦੀਆਂ ਫਸਲਾਂ ਵਿਚ ਆਉਣ ਵਾਲੀਆਂ ਬਿਮਾਰੀਆਂ ਅਤੇ ਕੀੜੇਆਂ ਬਾਰੇ ਆਪਣੇ ਵਿਚਾਰ ਸਾਂਝੇ ਕੀਤੇ । ਕਿਸਾਨਾਂ ਨੇ ਕਣਕ ਵਿਚ ਪੀਲੀ ਕੁੰਗੀ ਅਤੇ ਪੋਠੇ ਵਿਚ ਆਉਣ ਵਾਲੀਆਂ ਬੀਮਾਰੀਆਂ ਬਾਰੇ ਆਪਣੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ, ਜਿਨ੍ਹਾਂ ਦਾ ਸ਼੍ਰੀ ਰਾਕੇਸ਼ ਕੁਮਾਰ ਸ਼ਰਮਾਂ ਨੇ ਮੌਕੇ ਤੇ ਹੀ ਸਮਾਧਾਨ ਕੀਤਾ । ਡਾ. ਵਿਵੇਕ ਸ਼ਰਮਾਂ, ਅਸਿਸਟੈਂਟ ਸਾਇਲ ਕਮਿਸਟ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਮਿੱਟੀ ਪ੍ਰੀਖਣ ਦੇ ਲਾਭਾਂ ਅਤੇ ਖਾਦਾਂ ਦੀ ਸਹੀ ਵਰਤੋਂ ਲਈ ਜਾਗਰੂਕ ਕੀਤਾ। ਉਨ੍ਹਾਂ ਨੇ ਕਿਹਾ ਕਿ ਖੇਤ ਦੀ ਮਿੱਟੀ ਦਾ ਪ੍ਰੀਖਣ ਕਰਵਾ ਕੇ ਯੂਨੀਵਰਸਿਟੀ ਵਲੋਂ ਕੀਤੀ ਗਈ ਸਿਫਾਰਸ ਅਨੁਸਾਰ ਹੀ ਖਾਦਾਂ ਦੀ ਵਰਤੋਂ ਕੀਤੀ ਜਾਵੇ। ਕਿਸਾਨ ਗੋਸ਼ਟੀ ਵਿਚ ਆਏ ਮਹਿਮਾਨ, ਉਰਜ਼ਾ ਪ੍ਰਬੰਧਨ ਮਾਹਿਰ ਸ਼੍ਰੀ ਰਣਧੀਰ ਸਿੰਘ, ਜਿਲਾ ਪ੍ਰਬੰਧਕ, ਪੰਜਾਬ ਉਰਜ਼ਾ ਵਿਕਾਸ ਏਜੈਂਸੀ, ਹੁਸ਼ਿਆਰਪੁਰ ਨੇ ਕਿਸਾਨਾਂ ਨੂੰ ਗੋਬਰ ਗੈਸ ਪਲਾਂਟ ਲਗਾਉਣ ਲਈ ਪ੍ਰੇਰਿਤ ਕੀਤਾ। ਉਨ੍ਹਾਂ ਨੇ ਦੱਸਿਆ ਕਿ ਸਰਕਾਰ ਵਲੋਂ ਗੋਬਰ ਗੈਸ ਪਲਾਂਟ ਨੂੰ ਲਗਾਉਣ ਲਈ ੪,੦੦੦/- ਰੁਪਏ ਦੀ ਸਬਸਿਡੀ ਦਿੱਤੀ ਜਾ ਰਹੀ ਹੈ ਉਨ੍ਹਾਂ ਨੇ ਵਿਭਾਗ ਦੁਆਰਾ ਚਲਾਈਆਂ ਜਾ ਰਹੀਆਂ ਸੂਰਜੀ ਉਰਜ਼ਾ ਨਾਲ ਸਬੰਧਤ ਸਕੀਮਾਂ ਬਾਰੇ ਵੀ ਚਾਨਣਾ ਪਾਇਆ । ਡਾ. ਅਨਿਲ ਕੁਮਾਰ ਖੋਖਰ, ਅਸਿਸਟੈਂਟ ਐਗਰੋਨੋਮਿਸਟ ਨੇ ਕੰਢੀ ਖੇਤਰ ਵਿਚ ਜੱਲ ਤੇ ਮਿੱਟੀ ਬਚਾਓ ਬਾਰੇ ਕਿਸਾਨਾਂ ਨੂੰ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕੀਤੀ ਅਤੇ ਅੰਤ ਵਿਚ ਆਏ ਹੋਏ ਮਹਿਮਾਨ ਅਤੇ ਕਿਸਾਨ ਵੀਰਾਂ ਦਾ ਧੰਨਵਾਦ ਕੀਤਾ ।

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