Water Use Efficient Technologies for Improving Productivity and Sustainability of Sugarcane

(Final Report of Farmers' Participatory Action Research Programme, 2008-11)



Indian Institute of Sugarcane Research Lucknow- 226002

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Indian Institute of Sugarcane Research Lucknow- 226002, Uttar Pradesh, India (Indian Council of Agricultural Research)

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FOREWORD

In coming years, Indian agriculture will need more water to produce enough foodgrains to fulfill ever increasing requirement of growing population. On the other hand the actual availability of water will reduce and supply is projected at just half of the demand by the year 2030. This alarming scenario demand immediate interventions at farmers' fields to produce more foodgrain per drop of water. Sugarcane, an important cash crop of India, consumes considerable quantity of water than any other crops. Moreover, unscientific method of irrigation adopted by the farmers result into considerable loss of water. Indian Institute of Sugarcane Research, Lucknow devised irrigation water saving techniques in sugarcane like skip furrow irrigation, irrigation at critical growth stages, trash mulching and ring pit planting, which can enhance irrigation water use efficiency by 1.5 to 2.5 times. To exploit the potential of these water saving technologies, the Ministry of Water Resources, Govt. of India sponsored a Farmers' Participatory Action Research Programme (EPARP) to this institute for a period of three years (2008-2011).

The interdisciplinary team comprising Social Scientists, Agronomists, Soil Scientist, Water Conservation Engineer put their all efforts to transfer and popularise water saving sugarcane technologies among cane growers by implementing 100 demonstrations at farmers' fields in close collaboration with sugar mills. The results of demonstrations clearly indicate that the tangible benefits were accrued to the farmers in terms of irrigation water saving, enhanced income, increased knowledge & adoption. The fellow farmers of same villages and farmers from neighbouring villages got acquainted with the benefits of water saving technologies by visiting demonstration plots. This will serve as torch-bearer in spreading these technologies to larger areas.

(R.L. Yadav) Director IISR, Lucknow

PREFACE

Water is one of the most precious natural resource base supporting all kinds of life on this earth. It is critical input in food production for survival of human and animal life. Indian agriculture is producing enough food for 17% of the world population with only 2.3% of global land resources and 4% of available fresh water resources of the world. The per capita water availability in India decreased from 5300 m³ in 1951 to 1653 m³ in 2007, this trend is expected to reach as low as 1500 m³ by 2025, owing to climate change, global warming and ever increasing population. By 2020, Indian agriculture will need 29% more water, however, the actual availability of water is likely to reduce by 12%. The increase in water demand will be governed by growing demand for enough rice, wheat and sugarcane to meet ever increasing requirement of growing population. On the other hand the water supply is projected at just half of the demand by 2030. Under such an alarming scenario, management of water resources is going to play pivotal role in agricultural production system. At present, more than 80% of the exploitable water resources in the country is consumed by different agricultural activities. Irrigation is major water consuming activity in agriculture, where water use efficiency seldom exceeds 35% with prevalent method of irrigation.

Sugarcane, an important cash crop of the country, requires considerable quantity of water during its entire crop cycle of 12-18 months, depending upon agro-climatic regions varying from sub tropical to tropical. The annual water requirement of this crop in sub tropical states like Uttar Pradesh, Punjab, Haryana and Bihar is 1400-1500 mm. Majority of sugarcane farmers in these states irrigate sugarcane unscientifically with only 35-45% irrigation efficiency, leading to great loss of irrigation water. Research institutions of NARS, WALMI, etc. carried research to increase efficiency of surface irrigation methods, but technologies developed could not find way to the farmers' fields due to lack of resources and technology transfer mechanism. In the past, many researchers reported higher water use efficiency in sugarcane with techniques like skip furrow method of irrigation, irrigation at critical growth stages, trash mulching and ring pit method of planting. Irrigation water use efficiency in sugarcane with these water saving technologies can be enhanced by 1.5 to 2.5 times.

The Ministry of Water Resources, Government of India has initiated Farmers' Participatory Action Research Programme (FPARP) with the mission 'more income per drop of water'. In due recognition of water saving sugarcane technologies developed by IISR, The Ministry sponsored project entitled "Farmers' Participatory Action Research on Water Use Efficient Technologies for Improving Productivity and Sustainability of Sugarcane" to this Institute. Transfer and popularisation of these water saving sugarcane production technologies among sugarcane growers of Uttar Pradesh by implementing 100 demonstrations of one hectare each on farmers' fields was major objective of the project.

The project was implemented in 4 sugar mill zones of Sitapur and Barabanki districts of Uttar Pradesh. During 2008-2011, a total of 100 demonstrations (16 on ring pit method of planting, 32 on skip furrow method of irrigation, 24 on irrigation at critical growth stages and 28 on trash mulching in ratoon) were conducted. The quantum increase in irrigation water use efficiency and sugarcane yield recorded at farmers' fields are major achievements of the project. The increase in knowledge and adoption of water saving sugarcane technologies among the farmers is another feather to success of this project. At the same time accrued benefits due to enhanced yield, irrigation water saving and income increases satisfaction level of farmers with sugarcane cultivation.

The authors are indebted to the Ministry of Water Resources, Govt. of India, New Delhi for sponsoring the project. We express our heartfelt gratitude to all officials of Central Water Commission, New Delhi and Lucknow.

We express our sincere thanks to Dr. R.L. Yadav, Director, IISR for all his guidance, leadership and support throughout the project implementation period.

We are immensely grateful to the officers and cane development workers of Biswan Sugar Mill, Biswan; Kamlapur Sugar Mill, Kamlapur; Balrampur Chini Mills, Rauzagaon & Hydergarh for their generous help, support and logistics needed for smooth conduct of demonstrations in their mill zone areas.

Words cannot express our deep sense of gratitude to the sugarcane farmers for their whole-hearted participation in execution of the programme and also for their cosmopolite outlook of learning and interacting.

> Editors & Project Personnel

EXECUTIVE SUMMARY

Water and land are the two most critical resources to achieve the desired production of food, fibre, feed and fuel to sustain the demand of growing population. India has to produce annually 380 million tonnes of foodgrains to provide food and nutrition security to 17% of the world population with 2.3 per cent of land and 4 per cent of available fresh water resources of the world. Owing to the climate change, global warming and regular increase in population, the per capita water availability, which was more than 5300 m³ in 1951, has already dropped to 1653 m³ in 2007. Further, it is likely to be less than 1500 m³ by 2025 (less than the internationally prescribed safe level of 1700 m³). Agriculture is the main concern for India as far as the management of water resources of the country. Majority of cropped area is irrigated with surface methods for which water use efficiency seldom exceeds 35 per cent. Declining availability of water for agriculture warrants for enhancing the water use efficiency and water productivity in agriculture.

Sugarcane is one of the important cash crops in India. It is grown in two distinct agro-climatic regions; tropical and sub-tropical. Over 45 million farmers are involved in sugarcane production and about 7.5 per cent rural population is directly or indirectly dependent on the sugar industry. During the last five years (2004-05 to 2008-09), sugarcane is being cultivated annually over an area of 4.50 million ha comprising 1.79 million ha in tropical and 2.71 million ha area in sub tropical regions of the country. Sugarcane requires considerable quantity of water. The annual water requirement for this crop is 1400-1500 mm in sub tropical region. Majority of the farmers irrigate sugarcane unscientifically and therefore, irrigation efficiency at farmers' fields seldom exceed 35-45 per cent. Scientists have worked to enhance irrigation efficiency by adopting advance irrigation methods or by modifying existing surface irrigation methods. The water saving technologies developed, could not find way to the farmers fields due to lack of resources and technology transfer mechanism. Considering the importance of conserving ever depleting and degrading water resources, Ministry of Water Resources, Government of India has initiated Farmers' Participatory Action Research Programme (FPARP). Indian Institute of Sugarcane Research, Lucknow has also developed several water saving production technologies for sugarcane cultivation. In recognition of these water saving production technologies, Ministry of Water Resources, Government of India has entrusted this institute to transfer and popularise these technologies among

sugarcane growers to increase factor productivity. In light of this, present project was initiated with the objectives: (a) To demonstrate water use efficient sugarcane production technologies, (b) To work out the economics of demonstrated technologies at farmers' fields, (c) To establish *Gyan Chaupals* and impart training for reinforcing as well as sustaining knowledge and (d) To measure the technological and socio-economic impact of technologies.

To implement the project, two districts; Barabanki and Sitapur were selected purposively as these were in the list of agriculturally backward districts of the country as declared by the Planning Commission. From each selected district two blocks thus, 4 blocks were selected by following stratified random sampling procedure. During the project period, 100 demonstrations (16 on Ring pit method of planting, 32 on Skip furrow method of Irrigation, 24 on Irrigation at critical growth stages and 28 on Trash mulching) were conducted. To assess the impact of demonstrations, the economic and socio-psychological variables were also studied.

The results of demonstrations revealed that there was significant increase in crop yield, irrigation water saving and irrigation water use efficiency over farmers' practice. The maximum increase in cane yield was recorded in ring pit method of planting (96.4%) over the conventional method followed by skip furrow method of irrigation (38.8%), irrigation at critical growth stages (28.2%) and trash mulching (25.7%).

The saving in irrigation water varied from 21.7 to 44.5 per cent. The increase in irrigation water use efficiency (IWUE) was recorded highest in ring pit method of planting (142.6%) over the conventional method followed by irrigation at critical growth stages (85.2%), trash mulching (72.4%) and skip furrow method of irrigation (68.9%).

The average germination of sugarcane planted during the project period (2008-11) under ring pit method of planting was 70.80 per cent. Similarly, the average germination of cane planted under skip furrow method of irrigation and irrigation at critical growth stages (ICGS) were 37.20 and 36.70 per cents, respectively, which were higher than the germination under farmers' practice (35.10%).

At the first order of tillering stage, number of average tillers per hectare in demonstrated technologiess namely, ring pit planting method, skip-furrow method of irrigation, ICGS and trash mulching were recorded at 90533, 95500, 91838 and 109633, respectively, as compared to 91333 under farmers' practice. However, in the second order of tillering highest average number of tillers per hectare (285400) were recorded under ring pit method of planting followed by trash mulching

(258333), skip furrow method of irrigation (223100), ICGS (212267) and farmers' practice (205367). In third order of tillering, the highest average population of 298467 tillers ha⁻¹ was recorded with ring pit method of planting followed by ICGS (254667), skip furrow method of irrigation (245167) and trash mulching (244000).

At the time of grand growth period, the maximum average plant population was recorded with the ring pit method of planting (128367) followed by skip furrow method of irrigation (99167), ICGS (93833) and trash mulching (91233) as compared to the farmers' practice of 83500 plant ha⁻¹. The highest average number of millable cane (NMC) per hectare was recorded with ring pit planting method (122967) followed by skip furrow method of irrigation (93333), ICGS (89233) and trash mulching (87033) as compared to farmers' practice (77700).

Demonstrated water saving technologies enhanced income of the farmers. The benefit:cost (B:C) ratio under demonstrated technologies increased significantly. Highest increase in B:C ratio was observed in trash mulching technology and the lowest increase in ICGS. However, the B:C ratio under ring pit method of planting and skip furrow irrigation was statistically at par but significantly higher than that of farmers' practice.

After completion of demonstrations, it was observed that highest increase in soil organic carbon (OC %) was observed under trash mulching, followed by ring pit planting method. Under other demonstrated technologies, no significant change in soil organic carbon was observed. Regarding available N, P and K, no definite trend was observed.

Demonstrations conducted under FPARP on farmers' fields during the project period (2008-2011) resulted in considerable increase in knowledge level of farmers in general sugarcane cultivation practices as well as in water saving sugarcane technologies viz., ring pit method of planting, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching in ratoon. The knowledge score in general sugarcane cultivation before the start of FPARP was 49.56, which increased to 81.62 at the end of FPARP, recording 64.69% increase in knowledge level. At the same time, percentage increase in knowledge level of farmers in water saving technologies viz., ring pit, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching were 95.58, 85.78, 82.80 and 62.13 per cents, respectively. The cognitive domain of farmers were triggered by regular visit of scientists, interaction meeting with them, on farm discussion, distribution of literature etc. during implementation period of FPARP (2008-2011), as a result farmers increased their knowledge level.

Increase in knowledge level well supported by method & result demonstrations conducted at farmers' fields and critical input supplied/delivered to farmers under FPARP culminated into increase in adoption of sugarcane technologies by the farmers. The adoption level of farmer in general sugarcane cultivation was 38.61 (Pre-FPARP), which increased to 55.36 (Post-FPARP) recording an increase of 43.38 per cent. Likewise, the increase in adoption of water saving technologies viz., ring pit, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching were recorded to the extent of 81.18, 86.42, 84.81and 46.89 per cents, respectively. The considerable increase in adoption of water saving technologies clearly indicates farmers' satisfaction with performance of these technologies under their resource conditions.

Under FPARP, visiting scientists / officials organised group discussion with farmers to appraise them about facilities /provisions available with social organizations/ institutions/government departments and also made them aware to enhance their participation with these agencies in order to get benefited. As a result the participation of farmers in these social organization / institutions increased. The social participation of farmers increased from 16.35 to 21.61, recording an increase of 32.17 per cent.

Before the start of FPARP the mass media exposure of farmers was 16.35, which was recorded 21.61 at the end of FPARP, thus an increase of 32.17 per cent was recorded in mass media exposure. There are different extension functionaries/ agencies such as VLW, supervisor, BDO/CDO/ADO, sugar mill personnel, cane cooperative, KVKs, Research organization, etc. which extend or disseminate information related to cane cultivation, marketing, inputs, subsidies, advance methods etc. to the farmers. The farmers contact with these extension functionaries/ agencies increased from 15.60 to 22.34 with a percentage increase of 43.21 per cent. Effort under FPARP was also applied to assess that up to what extent cane growers were satisfied with sugarcane cultivation. Farmers obtained an average of 20.81 score against maximum obtainable score of 42 at the start of FPARP, which increased to 30.65. The increase in yield, water saving and income of farmers due to demonstrations of water saving technologies resulted into 47.28 per cent increase in farmers' satisfaction with cane cultivation.

The results of this project thus indicate that farmers of the areas where FPARP was implemented derived immense benefits in terms of knowledge enhancement, increased adoption, conserving water resource and higher income.

Introduction

India's population is likely to reach about 1.4 billion by 2025 AD with its current growth rate of about 1.9 per cent per annum. Such an increased population will further increase requirement for food, fibre, feed and fuel. To achieve the desired production of these needed items, land and water are the two most critical resources. Considering these resources, India has to produce annually 380 million tonnes of foodgrains to provide food and nutrition security to 17% of the world population on 2.3 per cent of land and with only 4 per cent of the available fresh water resources of the world. With increasing pressure of population, the per capita availability of arable land, which was 0.34 ha in 1950-51, is likely to shrink to 0.08 ha in 2025. Similarly, the per capita water availability, which was more than 5300 m³ in 1951, has already dropped to1653 m³ in 2007. Further it is likely to be less than 1500 m³ by 2025 (less than the internationally prescribed level of 1700 m³). Owing to the climate change, global warming and regular increase in population, it is decreasing every year and has already reached to water stress level (Fig.1). According to the modest estimates (Anon., 2006), water will become a scarce commodity during 2050 (Fig. 1). Simultaneously, the availability of water for agricultural use is decreasing due to diversion of irrigation water to other priority areas e.g. domestic, industries, energy etc. (Table1).

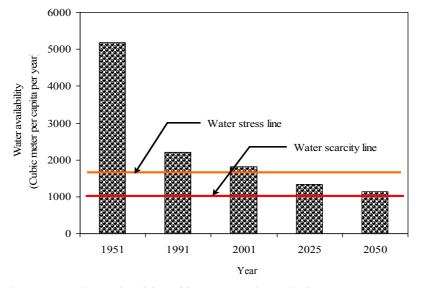


Fig.1. Per capita availability of fresh water in India (Source: Anon., 2006)

User sector	Year						
User sector	2000	2025	2050				
Irrigation	541 (85.3)	910 (83.3)	1072 (74.1)				
Domestic	42 (6.6)	73 (6.7)	102 (7.0)				
Industries	8 (1.3)	22 (2.0)	63 (4.4)				
Thermal power	2 (0.3)	15 (1.4)	130 (9.0)				
Others	41 (6.5)	72 (6.6)	80 (5.5)				
Total	634 (100)	1092 (100)	1447 (100)				

Table 1. Annual availability of fresh water (billion cubic metre)

*Figures in the parenthesis indicate per cent of total Source: (Anon., 2006)

According to the latest report from a study on the global water scenario by International Consultancy McKinsey in collaboration with the world bank affiliate-International Finance Corporation, released on 23 November, 2009 in Washington and published in the Times of India, Lucknow edition on 24 November, 2009, the water demand in India will grow annually by 2.8 per cent to reach a whopping 1500 billion cubic meter (BCM) during 2030. This increase will be driven by domestic demand for rice, wheat and sugar for the growing population, and a growing demand for diet. On the other hand, the water supply is projected at only about 744 BCM that is just half the demand. Globally, the water consumption at present is 4500 BCM which is projected to be 6900 BCM during 2030. This will be 40 per cent more than the estimated reliable and sustainable water supply today. It is further predicted that 40 per cent of the world population will face chronic water shortage by 2025. Evidently, in future, more food, fibre, feed, fodder and fuel have to be produced with less and less water and declining land resources.

Agriculture is the main concern for India as far as the management of water resources is concerned. It consumes more than 80 per cent of the exploitable water resources of the country (Table 1). The water use efficiency seldom exceeds 35 per cent in prevelent irrigation methods. The water availability for agriculture is declining. Such an alarming situation warrants for enhancing the water use efficiency and water productivity in agriculture.

Sugarcane is one of the important cash crops in India. It is grown in two distinct agro-climatic regions: tropical and sub tropical (Fig. 2). Maharashtra, Karnataka, Gujarat and Tamil Nadu in tropical region, while Uttar Pradesh, Punjab, Haryana and Bihar in sub-tropical region are the important sugarcane growing states. Uttar

Pradesh in sub-tropical and Maharashtra in tropical region, however, occupy the top position as far as sugarcane crop area and sugar industry are concerned. Over 45 million farmers are involved in sugarcane production and about 7.5 per cent rural population is directly or indirectly dependent on the sugar industry. During the last five years (2004-05 to 2008-09), sugarcane is being cultivated annually over an area of 4.50 million ha comprising 1.79 million ha in tropical and 2.71 million ha area in subtropical regions of the country. During this period, the average sugarcane productivity remained 81.83 t ha⁻¹ in tropics and 56.49 t ha⁻¹ in subtropics with the national average of 66.38 t ha⁻¹. By the year 2020, India will need 27.29 million tonnes of sugar to meet the demand of the increasing population. To produce this much sugar, the country will require annually 415 million tonnes of sugarcane from an area of 4.15 million ha having 100 t ha⁻¹, the average productivity of cane with 11.00 per cent sugar recovery.

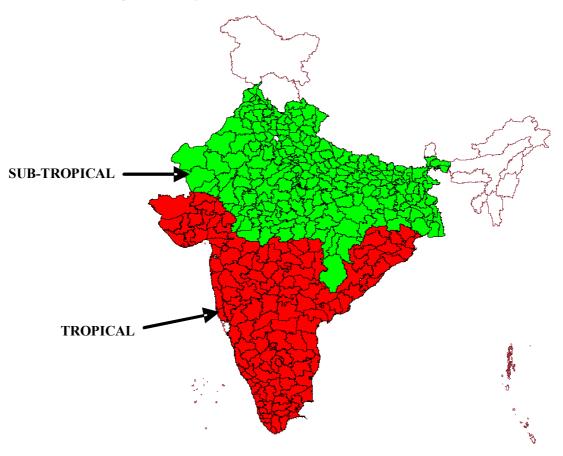


Fig. 2. Sugarcane growing zones in India

Sugarcane requires considerable quantity of water. The annual water requirement for this crop is 1400-1500 mm in sub tropics. Majority of the farmers irrigate sugarcane unscientifically and therefore, irrigation efficiency at farmers fields seldom exceed 35-45 per cent.

Though, India is placed among the countries having highest irrigated area but the productivity of irrigated land in India is very low as compared to the other countries. In the country 95 per cent of the farmers are irrigating their crops with surface irrigation method with 30-40 per cent irrigation efficiency. To increase irrigation efficiency of surface irrigation methods, voluminous work has been carried out by the research institutions of National Agricultural Research System, WALMI, etc., but the water saving technologies developed by these institutions could not find way to the farmers fields due to lack of resources and technology transfer mechanism. Scientists have worked to enhance irrigation efficiency by adopting advance irrigation methods or by modifying existing surface irrigation methods. Prasad *et al.* (1987) found higher water use efficiency with skip furrow irrigation as compared to check basin irrigation method. The water use efficiency for plant crop obtained by them was 2.97 and 2.31 t ha⁻¹-cm with skip furrow and check basin irrigation methods, respectively. Singh, et al. (1994) reported higher water use efficiency with alternate furrow irrigation method. The observed irrigation water use efficiency with alternate furrow irrigation was 0.75 t ha⁻¹-cm, higher in comparison to check basin and every furrow irrigation method, where the irrigation water use efficiency was 0.47 and 0.68 t ha⁻¹-cm, respectively. Hapse, et al. (1991) observed highest water use efficiency (0.79 t ha⁻¹-cm) with sub surface drip irrigation as compared to 0.33 t ha⁻¹-cm with conventional furrow irrigation method. Parikh et al. (1992) observed highest irrigation water use efficiency of 2.42 t ha⁻¹-cm when irrigation was applied through drip method at 0.3 IW/CPE ratio, while with furrow irrigation methods, irrigation water use efficiency achieved was only 0.90 t ha⁻¹-cm. To increase effectiveness of irrigation by reducing evaporation loss of moisture, trash mulching had been advocated by many researchers. Yadav and Prasad (1988) observed highest sugarcane yield and irrigation water use efficiency when irrigations are applied at 25 per cent deplition of available soil moisture. Motiwale and Singh (1971) observed higher irrigation water use efficiency with trash mulching. They reported 3.7 t ha⁻¹-cm and 2.3 t ha⁻¹-cm irrigation water use efficiency in the fields which received trash mulch and no-mulch, respectively. Therefore if the crop is irrigated scientifically, irrigation water use efficiency of sugarcane crop can be enhanced by 1.5 to 2.5 times. Considering the importance of conserving ever depleting and degrading water resources, Ministry of Water Resources, Government of India has initiated Farmers' Participatory Action Research Programme (FPARP).

Under FPARP, 5000 demonstrations on water saving technologies were carried out all over the country. Through these participatory demonstrations, not only the water saving technologies are transferred but also on field technology refinement is being done with the participation of the farmers. As this programme is implemented involving farmers as well as scientists, the scientists with the participation of farmers resolve the difficulties faced by the farmers in adoption of the technologies. Indian Institute of Sugarcane Research, Lucknow has also developed several water saving production technologies for sugarcane cultivation. In recognition of these water saving production technologies, Ministry of Water Resources, Government of India has entrusted this institute to transfer and popularise water saving technologies among sugarcane growers to increase factor productivity. In light of this a project entitled "Farmers' participatory action research on water use efficient technologies for improving productivity and sustainability of sugarcane" was implemented with the following objectives:

Objectives

- 1. To demonstrate water use efficient sugarcane production technologies.
- 2. To work out the economics of demonstrated technologies at farmers' fields.
- 3. To establish *Gyan Chaupals* and impart training for reinforcing as well as sustaining knowledge.
- 4. To measure the technological and socio-economic impact of technologies.

Description of water use efficient production technologies

The technologies identified for higher water use efficiency and selected for demonstration at farmers' fields in participatory mode are described as follows :

1. Ring pit method of planting : The field is marked at a regular distance of 105 cm, leaving 65 cm space in the beginning, both length and width wise. Nearly, 9000 pits per ha of 75 cm diameter and 30 cm depth are made by pit digger. The soil dugged up from the pit is kept in the periphery of the ring in 30 cm space left in between the two pits. In every pit, 3 kg farmyard manure or compost or press mud cake is mixed uniformly before placing the setts for planting. In addition to this manure, 8 g urea, 20 g DAP, 16 g MoP and 2 g zinc sulphate are also added in each pit. Twenty, two budded setts are placed in each pit like spokes in a cycle wheel. The chlorpyriphos solution is applied on the setts and 2-5 cm soil cover is made over the setts. One irrigation just after planting and blind hoeing prompt germination. Thirty days after germination, 16 g urea is applied in each pit and half of the soil remaining at periphery is filled back in

the pit. In the month of April-May, the remaining soil is filled back in the pit and 16 g urea per pit is also applied. The filling of soil is completed when all the mother shoots have emerged. The crop under ring planting consists mainly of mother shoots, which are thicker and heavier than tillers. Ratoon yields are also higher because of deeper planting of plant crop. As the irrigation water is applied in the pits only, more than 40 per cent surface area remains dry. For this reason, with the ring planting 25-30 per cent irrigation water is saved. Higher sugarcane yield and reduced quantity of irrigation water results in 30-40 per cent higher irrigation water use efficiency.

- 2. Skip furrow method of irrigation: In this method of irrigation, instead of irrigating all the rows and inter-row spaces, one row is skipped and irrigation is given in alternate rows. With this technique, limited water may be used to irrigate larger area. In this method, sugarcane is planted in flat bed as usual and after germination, 45 cm wide and 15 cm deep furrows are made in alternate inter-row spaces. At the time of irrigation, the furrows thus made are irrigated. Irrigating sugarcane with this method results in 36.5 per cent water saving and 64 per cent increase in water use efficiency.
- **3. Trash mulching:** Sugarcane trash is a waste material available after harvesting of the crop. Trash is spread @ 10 t ha⁻¹ in the alternate inter-row spaces in ratoon crop at the time of its initiation. Because of trash mulching, effectiveness of irrigation is increased as the evaporation losses of moisture from soil surface reduced considerably. Sugarcane crop yield and water use efficiency increases by 26 and 40 per cents, respectively, due to trash mulch as the trash mulch keeps the soil moisture at a higher level for a longer time as compared to uncovered soil surface. Increase in sugarcane yield due to trash mulch is attributed to favourable moisture condition, increased microbial activities and addition of water-soluble nutrients from the trash. In the long run, soil organic carbon content is also improved.
- 4. Irrigation at critical growth stages: In the areas of limited water supply, ensuring irrigation at critical period of water need of the crop and deferring the same at somewhat less critical period, improves yield and irrigation water use efficiency. These critical stages for sugarcane are emergence, first order of tillering, second order of tillering and third order of tillering. Depending upon the availability of water, the crop is irrigated at these stages. If two irrigations are available, then the irrigations are provided at second and third order of tillering. If three irrigations are available, then the irrigations are provided at all three orders of tillering. If four irrigations are available, then the irrigations are provided at all the four critical stages.

Methodology

Study locale and sampling

Two districts; Barabanki and Sitapur were selected purposively as these were in the list of the backward districts of the country as declared by the Planning Commission. From each selected district two blocks thus, 4 blocks were selected by following stratified random sampling procedure. During the project period, 100 demonstrations (Table-2) were conducted.

-				
Irrigation technology	Demor	Total		
Irrigation technology	2008-09	2009-10	2010-11	TOtal
Ring pit method of planting	2	13	1	16
Skip furrow method of Irrigation	14	10	8	32
Irrigation at critical growth stages	9	7	8	24
Trash mulching	10	10	8	28
Total	35	40	25	100

Table 2: Year wise break up of demonstrations

Criteria for farmers' selection

- > The farmer should have at least one ha area under sugarcane cultivation.
- > He must be growing sugarcane from last 4-5 years.
- He should be ready to spare his land for conducting demonstration as well as agree to actively participate.

Gyan Chaupal

In each village one *Gyan Chaupal* was established. To establish *Gyan Chaupals* opinion leader (s) in each village was/were identified. These leaders and beneficiary farmers worked as the member of the *Chaupals*. However, other interested farmers were also participated. The participating scientists worked as the precursor and guide to initiate and run the *Gyan Chaupals*.

Training

In each selected village every year 4-5 trainings were conducted prior to every critical field operations.

Observations recorded

- ➢ Germination (%)
- Plant Population at different growth stages
- Tiller population at tillering phases
- Cane yield
- ➢ Water use
- ➢ Economics

Variables and their Measurement

To assess the impact of demonstrations, the economic and socio-psychological variables were selected under the study and methods for their measurements are mentioned in table 3.

S. No.	Indicator	Observation	Tools/methods
1.	Knowledge	Pre & Post	Schedule
2.	Adoption	Pre & Post	Schedule
3.	Yield	Demonstration & Check	Weight of Harvested cane
4.	Water Saving	Demonstration & Check	Water meter
5.	Soil Health	Pre & Post	pH meter, E C Meter, Core Cutter, Infiltro meter and other prescribed standard procedure
6.	Income from sugarcane	Pre & Post	Schedule
7.	Social Participation	Pre & Post	Schedule
8.	Communication Behaviour	Pre & Post	Schedule
9.	Satisfaction with Sugarcane cultivation	Pre & Post	Schedule
10.	Benefit- cost ratio	Demonstration & Check	Estimation/calculation

Table 3: Indicators and methods for measuring impact

Data Collection and analyses

On above mentioned parameters data were collected periodically by following standard procedures and techniques and analyzed with the help of suitable statistical tools.

Operational steps

Ring-pit planting method

- > Leave 65 cm space around the boundary of the field.
- > Then mark the field at 105 cm both length and width wise.
- At the cross section of these lines, dig pit of 75 cm diameter and 30 cm depth with pit digger machine. In case, the machine is not available the pits are dug manually. Keep the dug out soil in the vacant space.
- Cut the cane stalks in 2 budded setts and dip them in 0.2 per cent solution of bavistin (2 g Bavistin in one liter of water).
- In each pit, apply mixture of 3 kg FYM + 20 g DAP + 8 g urea + 16 g MoP + 2 g ZnSO₄ and mix it with soil.
- In each pit, put 20 two-budded setts in a similar pattern as of spokes in a cycle wheel.
- Spray the solution of 5 liters Chlorpyriphos 20 EC dissolved in 1500-1600 liters of water on setts for one ha area.
- > Interconnect each pit with narrow channel manually for irrigating the pits.
- > Now cover the setts with 2-5 cm of soil layer.
- > Apply light irrigation just after planting.
- > When soil moisture reaches in workable condition, break the soil crust.
- Do first filling of pits with dug out soil at 4th leaf stage (35-40 days after planting in spring planting), apply light irrigation and topdress 16 g urea per pit when soil moisture reaches at workable condition.
- > Carry out weeding as and when required.
- ➢ By third week of June, apply urea @ 16 g per pit and in the last week of June, apply Furadan 3 G @ 33 kg per ha. The gap of at least 3-4 days must be kept in application of urea and Furadan.
- > Fill the pits with dug out soil completely by the last week of June.
- > Carry earthing -up before onset of monsoon.
- ▶ Tie cane in each clump in the 1st -2nd week of August with lower dry leaves.
- > In September, tie the clumps of opposite rows together.
- > Remove lower dry leaves.
- > Harvest the cane close to the ground level to take good ratoon crop.



Skip furrow method of irrigation

- > Prepare the field well for planting sugarcane.
- Cut the cane stalks in 3 budded sett and dip them in 0.2 per cent solution of bavistin (2 g Bavistin in one liter of water).
- > Open 12-15 cm deep furrows at 75 cm distance.
- > Apply 60 kg Urea, 130 kg DAP and 100 kg MoP per ha as basal dose in furrows.
- > Put treated setts in the furrows in bud-to-bud sett placement system.
- Spray the solution of 5 liters Chlorpyriphos 20 EC dissolved in 1500-1600 liters of water on the setts for one ha area.
- > Plank the field to cover the furrows.
- After germination (35-40 days after planting), make 45 cm wide and 15 cm deep furrows in alternate row spaces.
- > Irrigate the field through skip furrows.
- Top dress 110 kg urea per ha along the rows after the first irrigation (45-50 days after planting) and do hoeing.
- > Carry out the hoeing as and when required.
- > Irrigate the field 4-5 times at the interval of 25 days before onset of monsoon.
- By the last week of June, apply 110 kg urea per ha along the rows and after 3-4 days apply Furadan 3 G @ 33 kg per ha.
- > Follow plant protection measures as per the need.
- > Do earthing -up before onset of monsoon.
- ▶ Tie cane in each clump in the 1st -2nd week of August with lower dry leaves.
- > In September, tie the clumps of opposite rows together.
- Remove lower dry leaves.
- > Harvest the cane close to the ground level to take good ratoon crop.



Trash mulching

- ➢ Collect the trash.
- > Shave the stubbles if needed.
- > Irrigate the field just after collection of trash and stubble shaving.
- ➢ Do off barring/hoeing.
- > Do gap filling if needed through germinated sett.
- Apply 140 kg urea, 130 kg DAP and 100 kg MoP per ha as basal dose along the cane rows.
- > Apply trash in alternate rows.
- Apply second irrigation one month after ration initiation (at the first order of tillering).
- ▶ Top dress 100 kg urea.
- > Carry out hoeing operations in alternate rows having no trash mulch.
- Apply third irrigation one month after second irrigation (at the second order of tillering).
- > Do weeding and intercultural operations.
- > Top dress remaining 100 kg urea during mid June.
- > Do hoeing as and when required.
- Apply fourth irrigation one month after third irrigation (at the third order of tillering).
- > Apply Furadan 3 G @ 33 kg per ha in the last week of June.
- > Follow plant protection measures as per the need.



- > Do earthing before onset of monsoon.
- > Tie cane in each clump in the 1st -2nd week of August with lower dry leaves.
- > In September, tie the clumps of opposite rows together.
- > Remove lower dry leaves.
- > Harvest the cane close to the ground level.

Irrigation at critical growth stages

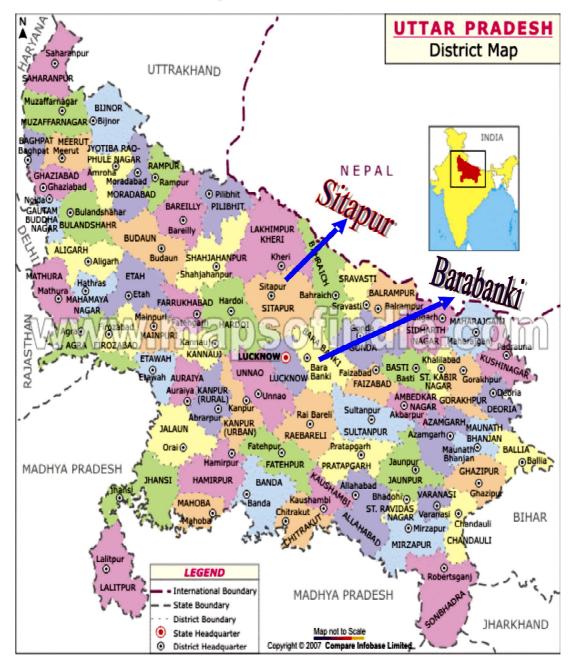
- > Prepare the field well for planting sugarcane.
- Cut the cane stalks in 3-budded sett and dip them in 0.2 per cent solution of bavistin (2 g Bavistin in one liter of water).
- > Open furrows of 12-15 cm deep at 90 cm distance.
- > Apply 60 kg urea, 130 kg DAP and 100 kg MoP per ha as basal dose in furrows.
- > Put treated setts in the furrows in bud-to-bud sett placement system.
- Spray the solution of 5 liters Chlorpyriphos 20 EC dissolved in 1500-1600 liters of water on the setts for one ha area.
- > Plank the field to cover the furrows.
- Irrigation
 - A) Control: Irrigation practices followed by the farmers
 - B) Treatment I
 - i) Depth of irrigation water-7.5 cm
 - ii) Time of irrigation First irrigation

First irrigation after germination Second irrigation at first order of tillering Third irrigation at second order of tillering Fourth irrigation at third order of tillering

C) Treatment II

- i) Depth of irrigation water-7.5 cm
- ii) No of irrigations same as followed by the farmers
- iii) Time of irrigation If farmer applies:
 4 irrigations after germination, 1st, 2nd and 3rd order of tillering
 3 irrigations 1st, 2nd and 3rd order of tillering
 2 irrigations 2nd and 3rd order of tillering
- Top dress 110 kg urea per ha along the rows after the first irrigation (45-50 days after planting) and do hoeing.
- > Carry out hoeing as and when required.
- By the last week of June, apply 110 kg urea per ha along the rows and after 3-4 days, apply Furadan 3 G @ 33 kg per ha.
- > Follow plant protection measures as per the need.
- > Do earthing -up before onset of monsoon.
- > Tie cane in each clump in the 1st -2nd week of August with lower dry leaves.
- > In September, tie the clumps of opposite rows together.
- Remove lower dry leaves.
- > Harvest the cane close to the ground level to take good ratoon crop.





Project Area Under FPARP

Map 1: Selected districts under the project



• Selected Blocks

Map 2: Blocks selected in Sitapur district



• Selected Blocks

Map 3: Blocks selected in Barabanki district

Results

Effect of demonstrated technologies on yield, irrigation water saving and irrigation water use efficiency in sugarcane

Total 100 demonstrations (Tables 2, 4) on the fields of cane growers in the sugar mill Zones of Biswan, Rauzagaon and Hydergarh were conducted during 2008-09, 2009-10 and 2010-11 crop seasons. The results of demonstrations revealed that there was a significant increase in crop yield, irrigation water saving and irrigation water use efficiency (Table 4). The maximum increase in cane yield was recorded in ring pit method of planting (96.4%) over the conventional method followed by skip furrow method of irrigation (38.8%), irrigation at critical growth stages (28.2%) and trash mulching (25.7%). The saving in irrigation water varied from 21.7 to 44.5 per cent. The increase in irrigation water use efficiency (IWUE) was recorded highest in ring-pit method of planting (142.6%) over the conventional method followed by irrigation at critical growth stages (85.2%), trash mulching (72.4%) and skip furrow method of irrigation (68.9%),

S. No.	Techno- logy	No. of demonst- rations	Averag (t h		Increase in cane yield (%)	app	igation water Saving IWUE applied in (kg cane ha- (ha-cm) irriga- tion		-	% Incr- ease in	
			Demonst-			Demonst-		water (%)	Demonst-		
			ration	ional		ration	ional	(79)	ration	ional	
	Skip- furrow	32	88.54	63.80	38.8	53.72	65.37	21.7	1648.21	975.96	68.9
	method										
	of										
	irrigation										
	Ring-pit method of planting	16	125.28	63.80	96.4	52.92	65.37	23.5	2367.46	975.96	142.6
-	Trash mulching	28	80.18	63.80	25.7	47.66	65.37	37.2	1682.21	975.96	72.4
4	ICGS	24	81.76	63.80	28.2	45.25	65.37	44.5	1807.05	975.96	85.2

Table 4. Effect of demonstrated technologies on yield, saving in irrigation water and irrigation water use efficiency in sugarcane

ICGS-Irrigation at critical growth stages, IWUE - Irrigation water use efficiency

Growth performance of sugarcane in demonstration plots

Germination: The average germination of crop planted during the project period (2008-11) in 16 demonstration plots under ring-pit method of planting was recorded at 70.80 per cent (Table 5). Similarly the average germination of cane planted under skip-furrow method of irrigation and irrigation at critical growth stages (ICGS) were 37.20 and 36.70 per cent, respectively. Which were higher than the germination under farmers' practice (35.10%).

Technology		Germination (%)					
Technology	2008-9	2009-10	2010-11	Average			
Ring pit method of planting	72.8	64.3	75.4	70.8			
Skip furrow method of irrigation	37.5	33.8	40.3	37.2			
ICGS	39.8	36.2	34.1	36.7			
Farmers' Practice	33.6	34.5	37.2	35.1			
SE _m ±			2.2				
CD (0.05)		7.0					

Table 5: Average germination in demonstrations and under farmers' practice

ICGS-Irrigation at critical growth stages

Tiller population at various stages: As evident from the results presented in the table 6, at the first order of tillering stage, average number of tillers per hectare in demonstrated plots under ring pit planting method, skip furrow method of irrigation, ICGS and trash mulching were recorded at 90533, 95500, 91838 and 109633, respectively, as compared to 91333 under farmers' practice. However, in the second order of tillering under ring-pit method of planting, highest average number of tillers per hectare (285400) was recorded (Table 7) followed by trash mulching

Table 6: Average Tiller population at first order of tillering in demonstrations and under farmers' practice

Technology	Tiller population at first order of tillering (per ha)					
recimology	2008-9	2009-10	2010-11	Average		
Ring pit method of planting	87500	94000	90100	90533		
Skip furrow method of irrigation	95000	94100	97400	95500		
ICGS	94500	93400	87600	91833		
Trash mulching	105300	114900	108700	109633		
Farmers' practice	91000	93500	89500	91333		
SE _m ±	1917					
CD (0.05)	6046					

(258333), skip furrow method of irrigation (223100) and ICGS (212267), as compared to the farmers' practice (205367). As evident from table 8, in third order of tillering the highest average plant population of 298467 tillers ha⁻¹ was recorded with ring pit method of planting followed by ICGS (254667), skip furrow method of irrigation (245167) and trash mulching (244000).

Table 7: Average tiller population at second order of tillering in demonstrations
and under farmers' practice

Technology	Tiller population	Tiller population at second order of tillering (per ha)					
recimology	2008-9	2009-10	2010-11	Average			
Ring pit method of planting	273500	294200	288500	285400			
Skip furrow method of irrigation	228400	225800	215100	223100			
ICGS	218000	213500	205300	212267			
Trash mulching	239000	278000	258000	258333			
Farmers' practice	205500	209200	201400	205367			
SE _m ±	6330						
CD (0.05)	19963						

Table 8: Average tiller population at third order of tillering in demonstrations and under farmers' practice

Technology	Tiller population at third order of tillering (per ha)						
recimology	2008-9	2009-10	2010-11	Average			
Ring pit method of planting	291600	308500	295300	298467			
Skip furrow method of irrigation	252000	248500	235000	245167			
ICGS	256000	263000	245000	254667			
Trash mulching	232000	264000	236000	244000			
Farmers' practice	213500	213600	211800	212967			
SE _m ±	6038						
CD (0.05)	19042						

Plant Population

Results presented in table 9 show that at the time of grand growth period the maximum average plant population was recorded with the ring pit method of planting (128367) followed by skip furrow method of irrigation (99167), ICGS (93833) and trash mulching (91233) as compared to the farmers practice of 83500 plant ha⁻¹. As evident from table 10 the highest average number of millable cane (NMC) that is 122967 ha⁻¹ was recorded with ring pit planting method followed by skip furrow method of irrigation (93333), ICGS (89233) and trash mulching (87033) as compared to farmers' practice (77700).

Table 9: Average plant population at the end of grand growth stage in demonstrations and under farmers' practice

Technology	Plant population at the end of grand growth stage (per ha) (October)					
	2008-9	2009-10	2010-11	Average		
Ring pit method of planting	115000	145500	124600	128367		
Skip furrow method of irrigation	94000	92000	111500	99167		
ICGS	97500	99400	84600	93833		
Trash mulching	87600	96800	89300	91233		
Farmers' practice	78700	82500	89300	83500		
SE _m ±	5633					
CD (0.05)	17764					

Table 10: Average Plant Population at harvest in demonstrations and under farmers' practice

Tashnalagy	Plant population at harvest (number per ha)					
Technology	2008-9	2009-10	2010-11	Average		
Ring pit method of planting	105000	143500	120400	122967		
Skip furrow method of irrigation	87500	86900	105600	93333		
ICGS	92000	95500	80200	89233		
Trash mulching	85000	92100	84000	87033		
Farmers' practice	73500	79400	80200	77700		
SE _m ±	6248					
CD (0.05)	19705					

Sugarcane yield

Sugarcane yield recorded under different demonstrated technologies (*viz.*, ring pit method of planting, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching) and under farmers' practice during all the three cropping seasons (2008-09, 2009-10 and 2010-11) are presented in table 11. Data reveals that yield of sugarcane was higher under demonstrated technologies as compared to that of under farmers' practice. Ring pit system of planting and skip furrow method of irrigation yielded significantly higher as compared to the farmers' practice and other demonstrated technologies. Although sugarcane yield under ICGS and trash mulching technologies increased by 28.2% and 25.7%, respectively, but it was not statistically significant.

Table 11 : Year-wise Yield (t ha⁻¹)

Technology	2008-9	2009-10	2010-11	Average	
Ring pit method of planting	98.50	147.33	130.00	125.28	
Skip furrow method of irrigation	86.69	85.43	93.50	88.54	
ICGS	83.78	88.33	73.17	81.76	
Trash mulching	75.92	88.30	76.33	80.18	
Farmers' practice	63.06	67.18	61.17	63.80	
SE _m ±	7.08				
CD (0.05)	22.32				

Irrigation water use efficiency (IWUE)

Demonstrated irrigation water saving technologies improved irrigation water use efficiency (IWUE) significantly over farmers' practice (table 12). The increase in IWUE under ring pit system of planting was the highest followed by irrigation at critical growth stages, trash mulching and skip furrow irrigation. Ring pit system of planting improved irrigation water was efficiency by 142.6%, however, with skip furrow irrigation the increase in IWUE was 68.9%.

Technology	2008-9	2009-10	2010-11	Average		
Ring pit method of planting	2614.29	2630.95	1857.14	2367.46		
Skip furrow method of irrigation	1829.73	1451.58	1663.33	1648.21		
ICGS	1812.78	2046.67	1561.71	1807.05		
Trash mulching	1805.83	1766.00	1474.81	1682.21		
Farmers' practice	1109.50	955.64	862.75	975.96		
SE _m ±	150.18					
CD (0.05)	473.63					

Table 12: Year-wise IWUE (kg ha⁻¹ cm⁻¹)

Benefit: Cost Ratio

Demonstrated water saving technologies resulted in enhanced benefits to the farmers. The benefit:cost ratio (B:C) under demonstrated technologies improved significantly. Highest improvement in B:C ratio was observed in trash mulching and the lowest improvement in ICGS. However, the improvement in B:C ratio under ring pit system of planting and skip furrow irrigation was statistically at par but significantly higher than that of farmers' practice (Table 13).

Technology	2008-9	2009-10	2010-11	Average	
Ring pit method of planting	1.85	2.03	1.52	1.80	
Skip furrow method of irrigation	2.04	1.96	1.86	1.95	
ICGS	1.91	1.45	1.30	1.55	
Trash mulching	2.28	2.83	2.08	2.40	
Farmers' practice	1.53	1.29	0.91	1.24	
SE _m ±	0.17				
CD (0.05)	0.53				

Table 13: Year-wise Benefit:Cost Ratio

Effect of demonstrated technologies on soil health

After completion of demonstrations it was observed that highest increase in soil organic carbon (OC %) was observed under trash mulching, followed by ring pit planting method. Under other demonstrated technologies, no significant change in soil organic carbon was observed. Regarding available N, P and K no definite trend was observed (Table 14).

	00	C (%)	N (kg ha-1)		P (kg ha-1)		K (kg ha-1)	
Technology	Before planting	After harvesting	Before planting	After harvesting	Before planting	After harvesting	Before planting	After harvesting
Ring pit method of planting	0.42	0.47	203.7	204.7	18.2	17.8	219.9	215.7
Skip furrow method of irrigation	0.43	0.44	213.7	196.1	19.0	19.3	225.5	224.6
ICGS	0.44	0.45	216.3	217.9	19.4	18.8	225.1	227.8
Trash mulching	0.42	0.48	209.9	198.9	20.1	19.5	225.5	234.9
Average	0.43	0.46	210.9	204.4	19.2	18.9	224.0	225.8
Farmers' practice	0.41	0.43	200.2	194.1	19.7	16.8	223.5	217.8

Table 14: Effect of demonstrated technologies on soil health

Effect of demonstrations on knowledge and adoption level of beneficiary farmers

As evident from Table 15, the demonstrations conducted under FPARP on farmers' fields duning the project period 2008-2011, resulted in considerable increase in knowledge level of farmers in general sugarcane cultivation practices as well as

in water saving technologies in sugarcane cultivation *viz.*, ring pit method of planting, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching in ratoon. The knowledge score in general sugarcane cultivation before the start of FPARP was 49.56, which increased to 81.62 at the end of FPARP, recording 64.69% increase in knowledge level. At the same time, percentage increase in knowledge level of farmers in water saving technologies *viz.*, ring pit, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching were 95.58, 85.78, 82.80 and 62.13 percents, respectively. The cognitive domain of farmers were triggered by *Gyan Chaupal* established, training imparted, regular visit of scientists, interaction meeting with them, on farm discussion, distribution of literature etc., during implementation period of FPARP (2008-2011), as a result farmers increased their knowledge level.

Increased in knowledge level, well supported by method & result demonstrations conducted at farmers' fields and critical input supplied/delivered to farmers under FPARP culminated into increase in adoption of sugarcane technologies by the farmers. The adoption level of farmers in general sugarcane cultivation was 38.61 (Pre-FPARP), which increased to 55.36 (Post-FPARP) recording an increase of 43.38 percent. Likewise, the increase in adoption of water saving technologies *viz.*, ring pit, skip furrow method of irrigation, irrigation at critical growth stages and trash mulching were recorded to the extent of 81.18, 86.42, 84.81and 46.89 per cents, respectively. The considerable increase in adoption of water saving technologies clearly indicate farmers' satisfaction with performance of these technologies under their resource conditions (Table 15).



	Knowledge score			Adoption score			
Particulars	Pre-	Post-	%	Pre-	Post-	%	
	FPARP	FPARP	increase	FPARP	FPARP	increase	
General sugarcane cultivation	49.56	81.62	64.69	38.61	55.36	43.38	
Ring pit method of planting	13.65	26.52	95.58	9.51	17.23	81.18	
Skip furrow method of irrigation	8.30	15.42	85.78	5.23	9.75	86.42	
ICGS	7.56	13.82	82.80	5.20	9.61	84.81	
Trash mulching	13.23	21.45	62.13	11.75	17.26	46.89	

Table 15: Effect of demonstrations on knowledge and adoption

Effect of demonstrations on social participation, communication behavior and farmers' satisfaction

The social organizations/institutions like *panchayat*, cooperative society, self help group, bank, farmers discussion group, religious committees, farmers' federation/union, political organization, etc. plays important role in extending social, economic and political benefits to the farmers for enhancing their farm income. Under FPARP, visiting scientists/officials organised group discussion with farmers to appraise them about facilities/provisions available with above mentioned social organizations/institutions and also made them aware to enhance their participation with these agencies in order to get benefited. As a result, the participation of farmers in these social organization/institutions increased. Table 16 clearly indicates that social participation of farmers increased from 16.35 to 21.61, recording an increase of 32.17 per cent.

Table 16: Effect of demonstrations on social participation, communication behaviour and satisfaction

Variable	Pre-FPARP	Post-FPARP	% increase			
Social participation	16.35	21.61	32.17			
Communication Behaviour						
1. Mass media exposure	11.56	16.45	42.30			
2. Extension contact	15.60	22.34	43.21			
Satisfaction with cane cultivation	20.81	30.65	47.28			

The communication behavior of farmers is an important socio-psychological profile, decide farmers response to different electronic and print media (mass media)

in receiving and utilizing farm information disseminated by mass media. Before the start of FPARP the mass media exposure of farmers was 11.56, which was recorded 16.45 at the end of FPARP, thus an increase of 42.30 per cent was recorded in mass media exposure (Table 16). This make farmers more cosmopolite in nature as regard to getting information from different channels of mass media. This will help farmers in advancing sugarcane farming and increasing their income. There are different extension functionaries/agencies such as VLW, supervisor, BDO/CDO/ADO, sugar mill personnel, cane cooperative, KVKs, Research organization, etc. which extend or disseminate information related to cane cultivation, marketing, inputs, subsidies, advance methods etc. to the farmers. As evident from Table 16, the farmers' contact with these extension functionaries/agencies increased from 15.60 to 22.34 with a percentage increase of 43.21.

Effort under FPARP was also applied to assess that up to what extent cane growers were satisfied with sugarcane cultivation. Farmers obtained an average of 20.81 score against maximum obtainable score of 42 at the start of FPARP, which increased to 30.65 (Table 16). The increase in yield, water saving and income of farmers due to demonstrations of water saving technologies resulted into 47.28 percent increase in farmers' satisfaction with cane cultivation (Table 16).



Farmers' feedback

Farmers' feedback towards demonstrated water saving technologies

1. Ring pit method of planting

- Farmers reported that the germination is more in ring pit system in comparison to conventional planting method.
- They experienced a saving of 35-40 per cent in irrigation water.
- This system requires more labour.
- Farmers realized that they obtained 1.5-2.0 times more yield under this system in comparison to conventional method of planting.
- This system prevents lodging of sugarcane due to deeper planting.
- Farmers felt difficulty in intercultural operations.
- Seed requirement is higher.
- Digging of pits manually is time consuming. Pit-digger is not easily available and is costly.
- Multiple ratooning with good yield is possible.
- 2. Skip furrow method of irrigation
- Sugarcane crop can be irrigated with 35-40 per cent less water and also requires less time, energy and labour.
- Cane girth, height and weight are either at par or slightly increased in comparison to conventional irrigation system.
- Weed infestation is less.
- Farmers experienced less lodging of cane.
- After 2-3 irrigations, furrows were slightly filled with soil and needed reshaping.
- Farmers experienced difficulty in hoeing because during hoeing some amount of soil goes in the furrows.
- 3. Irrigation at critical growth stages
- Farmers realized that they could achieve normal cane yield by applying four irrigations only instead of five irrigations applied normally.
- Cane lodging is less.
- Weed infestation is also less.

4. Trash mulching

- Farmers experienced a saving of irrigation water to a tune of 30-35 per cent.
- Weed emergence is checked where trash is placed.
- Cost of production is reduced as hoeing is not done in the mulched area of field as well as irrigation time is reduced.
- Farmers harvested the same tonnage by providing three irrigations as compared to five irrigations normally provided while field is not mulched with trash.
- Farmers observed good bud sprouting when ratoon is initiated during winter months.
- Farmers reported problems of snakes in mulched fields.

Publications/presentations from the project

Yadav, D. V., Verma. R. P., Prasad, K., Sah, A. K., Gupta, R. and Singh, K. P., 2009. Performance of water use efficient sugarcane technologies under farmers' participatory action research programme. Pub. In the proceeding of the Workshop on *Surface Water Resource Development & Management* on 17.03. 2009 organised by Ministry of Water Resources, CWC and Upper Ganga Basin Organisation at Lucknow, Pp. 100-112.

Yadav, D. V., Verma. R. P., K., Prasad, Sah, A., K., Gupta, R. and Singh, K. P., 2009. Participatory action research for irrigation water management in sugarcane cultivation. Pub. In the proceeding of the Conference on *Food and environmental security through resource conservation in central India: Challenges and Opportunities (FESCO-2009),* organised by Indian Association of Soil and Water conservationists, at Agra, 16-18 September, 2009, p. 18.

Yadav, D. V., Verma. R. P., Sah, A. K., Prasad, K., Gupta, R. and Singh, K. P., 2009. Enhancing irrigation water use efficiency in sugarcane cultivation at farmers' field: An action research. Pub. In the proceeding of the 5th Asian Regional Conference on *Improvement in Efficiency of irrigation projects through technology upgradation and better operation & maintenance*, organised by Ministry of Water Resources, Govt. of India at New Delhi, 6-11 December, 2009, p. 152.

Educational material developed

Extension Brochures

- 1. Ring Pit method of sugarcane planting for saving irrigation water. Prepared by- D. V. Yadav, R.P. Verma, Kasmta Prasad, A. K. Sah, Rajendra Gupta and K. P. Singh.
- 2. Irrigation Scheduling at Critical Growth Stages of sugarcane to save water. Prepared by- D. V. Yadav, R.P. Verma, Kasmta Prasad, A. K. Sah, Rajendra Gupta and K. P. Singh.
- 3. Skip-furrow method of irrigation for saving water in sugarcane. Prepared by-D. V. Yadav, R.P. Verma, Kasmta Prasad, A. K. Sah, Rajendra Gupta and K. P. Singh.
- 4. Trash mulching for saving irrigation water in sugarcane ratoon. Prepared by-D. V. Yadav, R.P. Verma, Kasmta Prasad, A. K. Sah, Rajendra Gupta and K. P. Singh.

प्रसार साहित्य

- 1. गड्ढ़ा बुवाई विधि अपनाकर सिंचाई जल की बचत करें । प्रस्तुति—डी. वी. यादव, आर. पी. वर्मा, कामता प्रसाद, ए. के. साह, राजेन्द्र गुप्ता, एवं के. पी. सिंह ।
- गन्ने की क्रान्तिक वृद्धि अवस्थाओं पर सिंचाई कर पानी बचाएँ। प्रस्तुति—डी. वी. यादव, आर. पी. वर्मा, कामता प्रसाद, ए. के. साह, राजेन्द्र गुप्ता, एवं के. पी. सिंह।
- एकान्तर नाली सिंचाई विधि अपनाकर गन्ने में पानी बचाएँ। प्रस्तुति—डी. वी. यादव, आर. पी. वर्मा, कामता प्रसाद, ए. के. साह, राजेन्द्र गुप्ता, एवं के. पी. सिंह।
- गन्ने की पेड़ी में पताई बिछाने से सिंचाई जल की बचत करें । प्रस्तुति—डी. वी. यादव, आर. पी. वर्मा, कामता प्रसाद, ए. के. साह, राजेन्द्र गुप्ता, एवं के. पी. सिंह।

Documentay films developed

- 1. Water saving Technologies in Sugarcane
- 2. सिंचाई जल बचत के लिए गन्ना उत्पादन तकनीक

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Area (ha) 0.250.501.001.000.251.001.01.01.0Annexure-I Sugarcane CoS 91248 CoS 91248 CoS 91248 CoS 91248 CoS 91248 CoS 8432 CoS 8432 CoS 8432 CoS 8432 variety Sugar Mill- Balrampur Chini Mill, Hydergarh Date of planting/ ratoon initiation Beneficiary farmers under FPARP (2008-09) 02.03.2008 04.03.2008 16.03.2008 01.03.2008 05.03.2008 05.03.2008 19.03.2008 05.03.2008 12.03.2008 Ganesh Bux S/O Chhatra Pal 1. Ram Adhar S/O Gurudayal W/O Rajendra Pratap Singh Manoj Singh S/O Narendra S/O Pratap Bahadur Singh Santosh Singh S/O Pratap Bahadur Singh 2. Barsati S/O Ram Dutt S/O Jagjivan Bux singh Name S/O Ram Pal Singh Jagjivan Bux singh Smt. Mamta Singh 4. Subham Singh <u>Bahadur Singh</u> Dal Bahadur Skip furrow method Skip furrow method Irrigation at Critical Trash mulching in I) Block- Hydergarh **District- Barabanki** Village – Garhi Satrahi Technology Trash mulching **Growth Stages** of irrigation Village- Beejapur of iiigation (ICGS) ratoon ICGS No. S. 3 Ţ 2 Ţ 2 3

Π	II) Block- Dariyabad	þŧ	Sugar Mill- Balrampur Chini Mill, Rauzagaon	r Chini Mill, Rauza	agaon		Far
S. No.	Technology		Name	Date of planting/ratoon initiation	Sugarcane variety	Area (ha)	
Villa	Village-Saidkhanpur						
Ţ	Trash mulching	Desh Raj V	Desh Raj Verma S/O Gurdin	07.03.2008	CoS 8432	1.00	
2	Skip furrow	Manendra 9	iendra Singh S/O Dinesh Singh	04.03.2008	CoS 8432	1.00	
	method of irrigation						
3	ICCS	Shushila Do	shila Devi W/O Devendra	18.03.2008	CoSe 92423	0.5	
		Pratap Bah	ap Bahadur S/O Jaibux Singh	18.03.2008	CoSe 92423	0.5	
Villa	Village- Udvatnagar						
1	Trash mulching	Bharat Kish	rat Kishore S/O Sharda Prasad	20.03.2008	CoSe 92423	1.00	
	Q						
2	Skip furrow method of	1. Cha S/C	Chandra Shekhar Tewari S/O Surya Prasad Tewari	30.03.2008	CoSe 92423	1.00	
	irrigation	2. Ran S/C	Ram Sundar Tewari S/O Gokul Prasad Tewari	15.03.2008	CoSe 92423	0.50	
		3. Ran S/C	Ramendra Kumar S/O Bharat Kishore	05.04.2008	CoS 98231	0.50	
3	I CCS	Anoop Kur S/O Sheo I	Anoop Kumar Sharma S/O Sheo Dulare Sharma	18.03.2008	CoS 96269, CoS 96275, CoS 98231	1.00	

chnologies

-	l) DIUCK- DISWAII	Sugar Mill- B	Sugar Mill- Biswan Sugar Mill, Biswan	ų		
S. No.	Technology		Name	Date of planting/ ratoon initiation	Sugarcane variety	Area (ha)
Villa	Village- Mouziddinpur					9
Ļ	Trash mulching	Hari Shankar S/	Hari Shankar S/O Bishambhar Dayal	12.03.08	CoS 97261	1.00
		Bindra Bux Singl	Bindra Bux Singh S/O Surya Bux Singh	12.03.08	CoS 8436	1.00
2	Skip furrow method	Iqbal Ahmad S/O Abdul Bari	O Abdul Bari	26.03.08	CoS 8436	1.00
	of irrigation	Malti Devi W/O Manohar Lal	Manohar Lal	23.02.08	CoS 8436	1.00
		Abdul Bari S/O Sharif	Sharif	20.02.08		1.00
	Ring pit method of	- -		04.03.08	CoS 8436	1.00
3	planting	Sagir khan S/O Mazid khan	Mazid khan			
	ICCS	Mod. Taskeen S/O Badrud Jama	'O Badrud Jama	25.02.08	CoS 8436	1.00
4.		Sami Ullah khan	Sami Ullah khan S/O Abdullah Khan	03.03.08	CoS 8432	1.00
Villa	Village- Piperkalan					8
1	Trash mulching	Smt. Mahrani W/OSri Ram	//O Sri Ram	25.02.08	CoS 8436	1.00
		Sarvajeet Singh S/O Balbir Singh	5/O Balbir Singh	21.02.08	CoS 8436	1.00
2	Skip furrow method	Manjit Singh S/O Balbir Singh) Balbir Singh	15.02.08	CoS 8436	1.00
		Curmeet Singh 5	Curmeet Singh S/O Basant Singh	26.02.08	CoS 8436	1.00
3	Ring Pit Planting	Ram Pal S/O Shatrohan Lal	atrohan Lal	25.03.08	CoS 88230	1.00
4	Irrigation at CGS	Sumeri Lal S/O Sri Ram	Sri Ram	15.03.08	CoS 8436	1.00
		Kanhya Lal S/O Sri Ram	Sri Ram	05.04.08	CoS 8436	1.00

District- Sitapur

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<u>`</u>	II) Block- Sidhauli	li Sugar Mill- Kamalapur Sugar Mill, Kamlapur	Mill, Kamlapur		
	Technology	Name	Date of planting/ ratoon initiation	Sugarcane variety	Area (ha)
and the owned	∕illage- Muzzafferpur	II			
	Trash mulching	Kaushlendra Singh S/O Surendra Vikram Singh	05.03.08	CoSe 92423	1.00
	Skip furrow method of	Dhirendra Vikram Singh S/O Kaushlendra Vikram Singh	06.03.08	CoSe 92423	1.00 1.00
	irrigation	Narendra Singh S/O Surendra Vikram Singh	08.03.08	-	
	ICCS	Shalendra Singh S/O Narendra Vikram Singh	12.03.08	CoSe 92423	1.00
and the second second	Village- Devipur				
	Trash Mulching	Nagendra Pratap Singh	28.03.08	Co S 97264	1.00
	Skip furrow method of irrigation	Pradeep Singh Chauhan	31.03.08	Co S 96268	1.00

	Ben	leficiary Farm	Beneficiary Farmers under FPARP (2009-2010)	2009-2010))
	District: Sitapur	Sugar Mill.	Sugar Mill- The Seksaria Biswan Sugar Mill, Biswan	n Sugar Mill, Bisw	an	
S. No.	Name	Village	Technology	Date of planting/ ratoon initiation	Sugarcane variety	Area (ha)
	Shiv Prakash S/O	Bambhor	Ring pit method of	25.02.09	CoSe 01424	1.00
-	Raghuraj Singh		planting		CoS 96275 CoS 0097	
	Sushila Singh W/O Shiv	Bambhor	Skip furrow method	28.02.09	CoSe 01424	1.00
2	Prakash		of irrigation		CoS 96275 CoS 0097	
	Mulayam Singh S/O	Bambhor	Ring pit method of	31.03.09	CoS 98231	1.00
3			planting		CoS 8432	
T	Ramesh Babu S/O Tulshi	Bambhor	Ring pit method of	06.03.09	CoS 8432	1.00
ŕ			pranung			
2	Bhagwant Singh	Bambhor	Skip furrow method of irrigation	14.03.09	CoSe 92423	1.00
9	Prabhakar Sharan Singh	Ghaila	Ring pit method of	12.03.09	CoS 8436	1.00
	S/O Sant Bux Singh		planting			
7	Shailendra Verma	Tikara	Ring pit method of	15.02.09	CoSe 98231	1.00
	S/O Ramchandra Verma		planting			
8	Ajay S/O Shri Asharfi Lal Shankarpur	Shankarpur	Ring pit method of planting	15.03.09	CoS 8436	1.00
6	Ram Kumar S/O Sarju Prasad	Shankarpur	Trash mulching	15.03.09	CoS 8436	1.00
10	Balaram S/o Gokaran	Kamiyapur	Ring pit method of planting	03.03.09	CoS 8436	1.00

Annexure-II

No.11Ram Dutt S/O C12Sageer Khan S/13Abdul Bari S/ C14Abdul Hadi S/ C15Syed Ali S/ O N16Ahmad S/ O Sy17Jageshwar S/ O18Khaleel Ahmad19Devendra Nath		0	0	e I I I I I I I I I I I I I I I I I I I		
				TAUMUR TRUTATION	variety	(ha)
	U Gokaran	Kamiyapur	Irrigation at critical	06.03.09	CoS 8436	1.00
	S/ O Mazeed	Mouziddinpur	Trash mulching	07.03.09	CoS 8436	1.00
	/ O Sharif	Mouziddinpur	Trash mulching	26.02.09	CoS 8432 CoS 88230	1.00
	5/ O Abdul Bari	Mouziddinpur	Skip furrow method of irrigation	10.02.09	CoS 88230	1.00
	O Madar Bux	Mouziddinpur	Ring pit method of planting	29.03.09	CoSe 92423	1.00
	Syed Ali	Mouziddinpur	Ring pit method of planting	31.03.09	CoS 97264	1.00
	' O Sahdev	Mouziddinpur	Trash mulching	25.02.09	CoS 8436	1.00
	S/ O Bilal	Kamapur	Ring pit method of planting	30.03.09	CoS 8436	1.00
Narendra Nath	ath S/ O ath	Kotara	Ring pit method of planting of Planting	08.03.09	CoS 8436	1.00
20 Adtiya Nath S/	O Janki Nath	Januwa	Ring pit method of planling	08.03.09	CoS 96275	1.00
21 Jasbeer Singh S, Singh	ו S/ O Mahendra	Puraini	Irrigation at critical growth stages	15.03.09	CoS 8436	1.00
22 Rajesh Kumar S Parmeshar	r S/ O	Devkaliya	Skip furrow method of irrigation	25.03.09	CoS 95422	1.00
23 Lal Ji S/ O Ram	am Ashraya	Majagavan	Irrigation at critical growth stages	31.03.09	CoS 8436	1.00
24 Pradeep Singh (S/ O Nagendra	h Chauhan Ira Pratap Singh	Devipur*	Trash mulching	15.02.09	CoS 96268	1.00

1Amrish CVitthal SlVitthal SlOm PrakOm Prak2Tung Na3Raj KumVinod Ku			6	planting/ ratoon initiation	variely	(ha)
	Amrish Chand S/O Ram Kailash	Saidkahanpur	Ring pit method of planting	29.10.08	CoS 8436	0.50
	Vitthal Sharma S/O Prahladh	Saidkahanpur	Ring pit method of planting	15.11.08	CoS 8436	0.25
	Om Prakash S/O Bhai Lal	Saidkahanpur	Ring pit method of planting	03.11.08	CoS 8436	0.25
	Tung Nath S/O Ram Kinkar	Saidkahanpur	Irrigation at critical growth stages	12.02.09	CoS 8436	1.00
Vinod Kı	Raj Kumar S/O Chhedi Lal	Saidkahanpur	Irrigation at critical growth stages	10.02.09	CoSe 92423	0.50
	Vinod Kumar S/O Shiv Paltan	Saidkahanpur	Irrigation at critical growth stages	05.03.09	CoSe 92423	0.50
4. Avdhesh	Avdhesh Kumar S/O Chhedi Lal	Saidkahanpur	Skip furrow method of irrigation	06.03.09	CuS 98231	0.50
Atm Pral 5/0 Sahi	Atm Prakash Singh 5/O Sahib Bux Singh	Saidkahanpur	Skip furrow method of irrigation	25.02.09	CoS 98231	0.50
5 Bhagwati	Bhagwati S/O Dev kali	Saidkahanpur	Trash mulching	20.01.09	CoSe 92423	1.00
6 Neelam V	Neelam W/O Lavkush	Udvatnagar	Trash mulching	28.02.09	CoS 98231	1.00
7 Dhan pal Singh S/ Singh	Singh S/O Mahadev	Udvatnagar	Skip furrow method of irrigation	17.04.09	CoS 98231	1.00
8 Mahendr S/O Girij	Mahendra Pratap Singh S/O Girija Bux Singh	Udvatnagar	Skip furrow method of irrigation	19.04.09	CoSe 92423	0.50
Rupesh Kumar S/O Bharat Kis	Rupesh Kumar S/O Bharat Kishore	Udvatnagar	Skip furrow method of irrigation	19.04.09	CoSe 92423	0.50

Sugar Mill- Balrampur Chini Mill, Rauzagaon

District: Barabanki

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Dist	District: Barabanki Su	ıgar Mill- Balra	Sugar Mill- Balrampur Chini Mill, Hydergarh	garh.		
S.	Name	Village	Technology	Date of	Sugarcane	Area
No.				planting/ratoon initiation	variety	(ha)
Ţ	Saroj Singh W/O Mahendra Vikram Singh	Garhi Satrahi	Trash mulching	23.01.09	CoS 91248	1.00
2	Mata Badal Singh S/O Nankau Singh	Garhi Satrahi	Trash mulching	25.02.09	CoS 91248	1.00
3	Tej Bahadur Singh S/O Harihar Singh	Carhi Satrahi	Skip furrow method of irrigation	15.11.08	CoS 91248	1.00
4.	Shanti Devi W/O Pratap Bahadur Singh	Bijapur	Skip furrow method of irrigation	22.02.09	CoS 8432	1.00
5	Raj Kumari W/O Ganesh Bux Singh	Bijapur	Skip furrow method of irrigation	10.02.09 18.04.09	CoS 91248 CoS 91248	0.50 0.25
	Surendra Bahadur S/O Shiv Sagar Singh Raiendra Bahadur Sin <i>e</i> h	Bijapur Bijapur	Skip furrow method of irrigation Skip furrow method of	05.03.09	CoS 91248	0.25
	S/O Shiv Sagar Singh	mdatu	irrigation			
9	Indra Jeet Singh S/O Amrika Singh	Bijapur	Irrigation at critical growth stages	01.03.09	CoS 91248	0.50
	Ram deen Pal S/O Ram Adhar	Bijapur	Irrigation at critical growth stages	10.03.09	CoS 91248	0.50
7	Sankar Bux Singh S/O Girija Bux Singh	Bijapur	Irrigation at critical growth stages	10.03.09	CoS 8432	1.00
80	Sita Pati W/O Narendra Bahadur Singh	Bijapur	Trash mulching	28.02.09	CoS 91248	1.00
		-			-	

Annexure-III

List of Beneficiary Farmers under FPARP (2010-2011)

District: Sitapur

Sugar Mill- The Seksaria Biswan Sugar Mill, Biswan

S. No.	Name	Village	Technology	Date of planting/ ratoon initiation	Sugarcane variety	Area (ha)
Г	Lacek Khan S/O Samir Khan	Kaimahara	Skip furrow method of irrigation	23.02.10	CoS 8436	1.00
2	Iqbal Ahmad S/O Abdul Bari	Maijuddinpur	Maijuddinpur Skip furrow method of irrigation	28.02.10	CoS 767	1.00
ŝ	Ramchandra Verma S/O Janki Prasad	Tikra	Skip furrow method of irrigation	26.02.10	Co 0238	1.00
4.	Maya Devi W/O Shalendra Verma	Tikra	Skip furrow method of irrigation	06.03.10	Co 0238	1.00
5	Bankc Lal S/O Ramasrc	Shankarpur	Skip furrow method of irrigation	14.02.10	CoS 8436	1.00
6	Shavitri Devi S/O Maiku Lal	Maijuddinpur	Maijuddinpur Irrigation at critical growth stages	12.02.10	Co S 767	1.00
L	Shamad Khan S/O Abdul Bari	Bakharia	Irrigation at critical growth stages	15.02.10	CoS 8436	1.00
8	Samun Khan S/O Irshad Khan	Parsehra	Irrigation at critical growth stages	15.02.10	CoSe 95422	1.00
6	Trimohan Lal S/O Mistri Lal	Majhiganwan	Majhiganwan Irrigation at critical growth stages	15.02.10	U. P. 0097	1.00
10	Surya Prasad S/O Rameshwar	Benwaiya	Trash mulching	03.03.10	CoS 8436	1.00
11	Malti Devi W/O Suryprasad	Benwaiya	Trash mulching	06.03.10	CoS 96268	1.00
12	Ram Sewak Verma S/O Gajodhar Prasad	Ramkund	Trash mulching	07.03.10	CoS 8436	1.00
13	Ramesh Babu S/O Tulsi	Harsighpur	Trash mulching	26.02.10	CoS 8432	1.00
14	Aditya Nath S/O Janki Nath	Bhagwanpur Janua	Trash mulching	10.02.10	CoS 767	1.00
15	Ram Prasad S/O Hardwari	Benwaria	Trash mulching	9.03.10	CoS 98231	1.00
16	16 Pradip Singh Chauhan S/O Nagendra Singh Chauhan	Devipur	Trash mulching	13.02.10	CoS 96268	1.00

Dist	District: Barabanki	Sugar Mill- Ba	Sugar Mill- Balrampur Chini Mill, Rauzagaon	Rauzagaon		
S. No.	Name	Village	Technology	Date of planting/ ratoon initiation	Sugarcane variety	Area (ha)
	Madan Lal S/O Ishwardin Radhey Shyam S/O Shiv Dutt	Utwan Vir ki Thhayeen	Trash mulching Trash mulching	13.02.10 13.02.10	CoS-92423 CoS-767	0.50 0.50
2	Ram Avtar S/O Ram Prasad Lila Singh W/O Atmprakash	Akbarpur Saidkahanpur	Skip furrow method of irrigation Skip furrow method of irrigation	3.02.10 8.02.10	CoS 97264 CoS 97264	0.5 0.5
ŝ	Ram Pal S/O Ram Ratan	Gangauli	Irrigation at critical growth stages	18.02.10	CoS 97264	1.0
4	Birendra Bahadur Singh S/O Maharaj Bux Singh	Dhamapur	Irrigation at critical growth stages	16.02.10	CoS 97264	1.0
പ	Sidhdhanath S/O Mata Prasad	Sisauna	Ring pit method of planting	14.10.09	Co S -8436	1.0

a)

S.TechnologyDate of planting/rationSugarcane varietyLethology1Rampher ShuklaBudhnapurSkip furrow method of irrigation13.02.10CoS 912482Ramphar ShuklaBudhnapurSkip furrow method of irrigation13.02.10CoS 912482Ram Milan Yadav S/O KhushiramKanwanSkip furrow method of irrigation13.02.10CoS 912483Rajesh Kumar Singh S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation13.02.10CoS 912484Baj Kumar Singh S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation13.02.10CoS 912484Baj Kumar Singh S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation13.02.10CoS 912485Nahendra Pal Singh S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation12.02.10CoS 912484Brajendra Pal Singh S/O Jagannath SinghKanwanSkip furrow method of irrigation12.02.10CoS 912484Brajendra Pal Singh S/O Jagannath SinghKanwanSkip furrow method of irrigation13.02.10CoS 912485S/O Jagannath Singh Kuwan Singh KachhawahBaiwapur irrigationSkip furrow method of irrigation13.02.10CoS 91248	Dis	District: Barabanki Sug	ar Mill- Balı	Sugar Mill- Balrampur Chini Mill, Hydergarh	lergarh		
Rampher ShuklaBudhnapur irrigationSkip furrow method of irrigation13.02.10CoS 91248S/O RampyareRam Milan YadavSkip furrow method of irrigation15.02.10CoS 91248S/O KhushiramKanwanSkip furrow method of irrigation15.02.10CoS 91248S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation13.02.10CoS 91248Raj Kumar SinghKanwanSkip furrow method of irrigation13.02.10CoS 91248Raj Kumar SinghKanwanSkip furrow method of irrigation13.02.10CoS 91248S/O Mahendra Pal SinghKanwanSkip furrow method of growth stages11.02.10CoS 91248Brajendra Pal SinghKanwanSkip furrow method of irrigation11.02.10CoS 91248S/O Jagannath SinghBaiwapurSkip furrow method of irrigation11.02.10CoS 91248	S. No	. Name	Village	Technology	Date of planting/ratoon initiation	Sugarcane variety	Area (ha)
Ram Milan YadavKanwanSkip furrow method of irrigation15.02.10CoS 91248S/O KhushiramS/O Khushiramirrigation13.02.10CoS 91248S/O Mahendra Pal SinghKanwanSkip furrow method of irrigation13.02.10CoS 91248Raj Kumar SinghKanwanIrrigation13.02.10CoS 91248S/O Mahendra Pal SinghKanwanIrrigation at critical12.02.10CoS 91248.Brajendra Pal SinghKanwanIrrigation at critical12.02.10CoS 91248.Brajendra Pal SinghKanwanSiop furrow method of11.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of11.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of11.02.10CoS 91248.Brajendra Pal SinghKuwanr Singh KachhawahBaiwapurSkip furrow method of15.02.10CoS 91248	~	Rampher Shukla S/O Rampyare	Budhnapur	Skip furrow method of irrigation	13.02.10	CoS 91248	1.00
Rajesh Kumar Singh S/O Mahendra Pal SinghKanwan irrigationSkip furrow method of irrigation13.02.10CoS 91248S/O Mahendra Pal SinghKanwanIrrigation at critical growth stages12.02.10CoS 91248S/O Mahendra Pal SinghKanwanIrrigation at critical growth stages12.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of irrigation11.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of irrigation11.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of irrigation11.02.10CoS 91248	2	Ram Milan Yadav S/O Khushiram	Kanwan	Skip furrow method of irrigation	15.02.10	CoS 91248	0.50
Raj Kumar SinghKanwanIrrigation at critical12.02.10CoS 91248S/O Mahendra Pal Singhgrowth stages11.02.10CoS 91248.Brajendra Pal SinghKanwanSkip furrow method of11.02.10CoS 91248.S/O Jagannath SinghKanwanSkip furrow method of11.02.10CoS 91248Kuwanr Singh KachhawahBaiwapurSkip furrow method of15.02.10CoS 91248		Rajesh Kumar Singh S/O Mahendra Pal Singh	Kanwan	Skip furrow method of irrigation	13.02.10	CoS 91248	0.50
KanwanSkip furrow method of11.02.10CoS 91248irrigationirrigation15.02.10CoS 91248awahBaiwapurSkip furrow method of15.02.10CoS 91248	З	Raj Kumar Singh S/O Mahendra Pal Singh	Kanwan	Irrigation at critical growth stages	12.02.10	CoS 91248	1.00
Skip furrow melhod of 15.02.10 CoS 91248 irrigation	4.	Brajendra Pal Singh S/O Jagannath Singh	Kanwan	Skip furrow method of irrigation	11.02.10	CoS 91248	0.50
		Kuwanr Singh Kachhawah	Balwapur	Skip furrow melhod of irrigation	15.02.10	CoS 91248	0.50

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				Annexure-IV
	Village wise-c	Village wise-data for FPARP Evaluation (2008-09)	<u>tion</u> (2008-09)	
Name c	Ę	rict and Village: Uttar Pradesh, Barabanki, Garhi Satrahi	Garhi Satrahi	
Agro cl	Agro climatic zone : Upper Gangetic Pl	Upper Gangetic Plain Region, Average annual rainfall of the location: 787 mm	ual rainfall of the lo	ation: 787 mm
Particulars		Dal bahadur	Jagjivan Bux Singh	Mamta Singh
	Age	50	65	35
		Male	Male	Female
stəi	Experience in Farming (in years)	32	45	15
		Degree	Illiterate	Intermediate
8		5	3	2
uņ	owned (ha) Dry land			
edi	Source of irrigation	Tube well, canal	Tube well, canal	Tube well,
e actic Situc Citos e	Major crops grown	 Sugarcane, mentha, urd, lentil, pea, paddy, wheat 	Sugarcane, mentha, pea, paddy, wheat	Sugarcane, mustard, paddy, wheat, lentil
I	Knowledge in water management	Average	Poor	Poor
	Average income of the farmer from	35, 000	30, 000	25, 000
De	crops (Rs/year /ha)			
	Average income from non			I
	agriculture (Rs/year)			
	Soil Type	Sandy loam	Sandy loam	Sandy loam
	Name of the crop	Sugarcane	Sugarcane	Sugarcane
	Season		- Spring '08	- Spring '08
iste noi	Area under action research (ha)	1	1	1
	Type of irrigation technology used	Skip furrow method of irrigation	Flood method ——	Irrigation at critical growth stages

Final	Peport (2008-11)	
$ \begin{bmatrix} - \\ - \\ 1700 \\ - \\ 1500 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$	Irrigation at critical growth stages 72 72 72 72 3600 3600 60 60 60 60 60 60 60 60 72 60 60 72 72 72 72 72 72 72 60 60 72 <	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Trash mulching 65 91,000 3250 146 2 Learned the new technology Will follow in future Nil Nil Showledgeable and helpful	
1150 One crop season 1440 1140 30,000 10,000 20,000 14 14	Skip furrow method of irrigation 74 1,03,600 3700 57 1,03,600 3700 57 1,03,600 3700 57 1,03,600 1,03,600 57 1,03,600 1,03,600 57 1,03,600 1,03,700 1,03,600 1,03,600 1,03,600 1,03,700 1,03,600 1,03,700 1,03,600 1,03,700 1,00000000	
Edit of material (Rs/ha) Life of material (Rs) Edit of material (Rs) Life of material (Rs) Edit of material (Rs) Dependent (Rs/ha) Edit of material (Rs/ha) Cost shared by implementing institution (Rs/ha) Edit of cost shared by implementing institution (Rs/ha) Cost shared by implementing institution (Rs/ha) Water used for crop Depth of irrigation under action research (cm) Project No. of irrigation Water used in Depth of irrigation	Type of crop related technology Prield (t/ha) Prield (t/ha) Prield (t/ha) Value of the main product Value of the by- product Vield under conventional irrigation (t/ha) Number of farmer visiting the action research Number of farmers willing to adopt technology Lesson learned from the action research Follow-up in future Follow-up in future Farmers opinion about implementing research team	
	Popda Cropda Number Lesson la Follow-u Farmers	

Name of State, District and Village: Uttar Pradesh, Barabanki, Bijapur

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											Fi	nai	l R	ер	ort	(2	20	08	-11	!)										
1875	One cron	season	2625	225	2400	30, 000	11350	18650	10	0	12	5	Trash	mulching			66	92,400	3200	47	4	4	Learned the Learned the	new tochrology	Will follow in	future	Ti technical to	adopt	Knowledgeable and helpful	
1150	non	season	1550	300	1250	30,000	10,000	20,000	10	4	15	4	Skip	Furrow	method of	nungamon		1,036,00	3700	59	5			new	Will follow		cal	to adopt	Knowled- geable and helpful	
1875	One crop	season	2200	200	2000	28,000	11350	16650	10	4	15	4	Trash	mulching			65	91,000	3250	47	4	3	Learned the	new	Will follow	in future	Need more	labour	Knowled- geable and helpful	
1150	One crop season		1800	200	1600	30,000	10,000	20,000	8	5	12	4	Skip Furrow	method of	irrigation		72	1,00,800	3600	58	5	4	Learned the new	technology	Will follow in	future	Need more	labour	Knowledgeable and helpful	
1875	rion season		2150	150		28,000	11350	16650	8	5	10	3	Trash mulching					9	3200	46	4	3	Learned the new Learned the new	technology	Will follow in	future	Non-availability	of labour	Knowledgeable and helpful	
1875	10/01	One crop season	1700	200	1.500	30,000	11,350	18,650	10	4	15	4	Trash mulching		-		65	91,000	3250	46	4	3	Learned the new	technology	Will follow in	future	Non-availability	of labour	Knowledgeable and helpful	
Camital cost (Rs/ha)	(m) T	Luife of material	(Rs/ha)			ivation (Rs/ha)	드 이 Cost shared by implementing 표 뎓 institution (Rs/ha)	armer (Rs/ha)	th of irrigation)	rrch No. of irrigations	ised in tional	of irrigations	Type of crop related technology				g g Yield (t/ha)	g 😇 🔁 Value of the main product	🛱 👼 Value of the by- product	onal irrigation	Number of farmer visiting the action research	Number of farmers willing to adopt technology	Lesson learned from the action research		Follow-in future		Constraints faced		Farmers opinion about implementing research team	

			/	j	/		/	/			/			/		/		/		/	/		
Farmers	5' (/ ,				!								
ttion: 787 mm	Bharat Kishore	70	Male	52	Middle	3.4	/	Tube well, canal	Sugarcane,	wheat, lentil ,	paddy,	Mustard	Average	<u>40 000</u>	ουλυσ		Sandy loam,	Sugarcane	Spring '08	1	Flood method		[
agar nfall of the loca	Ramender Kumar	38	Male —	20	Intermediate	1		Tube well, canal	Sugarcane,	wheat, lentil	paddy, Mustard		Average	40 000	00,000]	Sandy loam	Sugarcane	Spring '08	0.5	Skip furrow Irrivation	0	
nd Village: Uttar Pradesh, Barabanki, Udvatnagar er Gangetic Plain Region, Average annual rainfall	Ram Sundar Tiwari	60	Male	45	Intermediate	1.5		Tube well	Sugarcane,	wheat, lentil	paddy,	Mustard	Poor	10.000	40,000	1	Sandy loam	Sugarcane	Spring '08	0.5	Skip furrow Irrivalion	0	
Pradesh, Bara Region, Avera	Chandra Shekhar	42	Male	20	Intermediate	1.8		Tube well	Sugarcane,	wheat, paddy,	mentha &	mustard ,	Average	50 MM		/	Sandy loam	Sugarcane	Spring, 08	1	Skip furrow Irrivation	0	
illage: Uttar ingetic Plain	Anoop Sharma	38	Male —	13	Graduate	2.5		Tube well	Sugarcane,	wheat,	paddy,	mentha & mustard	Average	40 MM	ou, uuu	25, 000	Sandy loam	Sugarcane	Spring '08		Irrigation at critical	growth stages	100 Pro-
Name of State, District and Village: Uttar Pradesh, Barabanki, Udvatnagar Agro climatic zone : Upper Gangetic Plain Region, Average annual rainfall of the location: 787 mm	Name of farmer		Sex	Experience in Farming (in years)	Education qualification	Irrigated	owned (ha) Dry land	Source of irrigation			Major crops grown		Knowledge in water management		Average income of the farmer from crops (Rs/year /ha)	Average income from non agriculture (Rs/year)	Soil Type	Name of the crop	Season	Area under action research (ha)	Type of irrigation technology		
Ν. Αξ	Parliculars		-	guitae	diə	nti	əd	sıəu	iari	(<i>/</i> ,	:บุ เอน	rarn earc	sər ı əyş	10 0	alis. acti	ihe Det				lo el sesr			

	Capital cost (Rs/ha)		1150	1150	1150	1875	
	Life of material		One crop season	One crop season	One crop season	One crop season	
	- g Operational cost (Rs/ha)	1500	1800	1800	1800	1600	
	pə	150	200	200	200	150	
	- 📅 Sthers (Rs/ha)	1350	1600	1600	1600	1450	
	표 정Total cost of cultivation 로 더(Rs/ha)	27,000	29000	29030	30,000	28,000	
	b E Cost shared by		10,000	10,000	10,000	11,350	
	Jec	6, 610					
	Cost shared by farmer (Rs/ha)	20, 390	19000	19000	20,000	16,650	
	Water used Depth of irrigation	10	10	10	10	10	
	1.10						
	under	4	5	2	4	4	
	action research						
	project						
	Water used Depth of irrigation	15	12	15	14	15	
	convention No. of irrigations al irrigation	0	ц	9	6	•	
	Type of crop related technology	Irrigation at critical	Skip furrow	Skip furrow	Skip furrow	Trash Mulching	
		growth stages	Irrigation	Irrigation	irrigation		
F	Yicld (I/ha)	70	73	75	78	74	
əu		98, 000	102200	105000	109200	103600	
one 100 9ue 8 d	Value of the by- product						
	Yield under conventional irrigation (Kg/ha)	55	55	60	58	55	
Number of	Number of farmer visiting the action research	4	<u>м</u>	2	2	5	
Number of	Number of farmers willing to adopt	2	Đ	3	3	3	
teennology			_	_			
Lesson lean	Lesson learned from the action research	Learned the new	Learned the new	Learned the new	Improved existing	Learned the new	
		technology	technology	technology	method	technology	
Follow-up in future	in future	Will follow in future	Will follow in future	Will follow in future	Will follow in future	Will follow in	
Constraints faced	faced	Nil	Need more labour	Nil	Nil	Nil	
Farmers opi team	Farmers opinion about implementing research team	ch Knowledgeable and helpful	Knowledgeable and helpful	Knowledgeable and helpful	Knowledgeable and helpful	Knowledgeable and helpful	

Barabanki, Saidkhanpur	Average rainfall of the location: 787 mm
Name of State, District and Village: Uttar Pradesh,	Agro climatic zone : Upper Gangetic Plain Region

Desh Raj Verma Pratap P 50 55 Pretato 50 55 Pertence in Farming (in years) 30 32 Pertence of irrigation High School Middle Dy land 6.2 3.5 3.5 Uroc of irrigation East paddy 3.5 3.5 Unce of irrigation East paddy Sugarcane, wheat, paddy, mentha & mustard Unce of irrigation Potato, Mustard Minstard Minstard Owledge in water mearagement Potato, Mustard Minstard Minstard Owledge in water mearagement 50,000 25,000 25,000 Sugarcane Sugarcane Sugarcane Sugarcane Owledge in water mearagementer Sugarcane Sugarcane In Type Sugarcane Sugarcane Sugarcane Owledge in water mearagementer Sugarcane Sugarcane Sugarcane Owledge in water mearagementer Sugarcane <	Mahendra Singh	24	Male	4	Intermeciate	3		Tube weil,		Sugarcane,	wheat,	mentha,	paddy,	Mustard	Average	30,000		1	Sandy loam,	Sugarcane	Spring '08	1	Skip furrow	Irrigation	
Pesh Raj Verma Desh Raj Verma Perience in Farming (in years) 50 Perience in Farming (in years) 30 Perience in Farming (in years) 30 Perience in Farming (in years) 30 Incation qualification 199 Islance owned Irrigated Islance owned 50 Islance of irrigation 6.2 Incre of irrigation 7 Incre of the farmer from crops 50,000 Incre of the crop 5.000	Sushila Devi	50	Female	30	High School	2		Tube well,		Sugarcane,	wheat, paddy,	Mentha			Poor	30,000		1	Sandy loam,	Sugarcane	Spring '08	0.5	Irrigation at	Critical growth	stages
Periment Name of farmer Perime in Farming (in years) 30 Perime in Farming (in years) 31 Perime in Farming (in years) 36 Perime of inigation Dry land Ince of the farmer from crops 56 Silvear / ha) Ender lane Ince of the crop Dry land Ince of the crop Dry land Ince and income from non agriculture (Rs/year) Dry land Ince and the crop Dry land	Pratap Bahadur	55	Male	32	Middle	3.5	J	Tube well &	canal	Sugarcane,	wheat, paddy,	mentha &	mustane		Average	25, 000		I	Sandy loam,	Sugarcane	Spring '08	0.5	Irrigation at	Critical	Growth stages
e perience in F perience in F ucation qual tel arca own i) urce of irriga owledge in t erage incom erage incom il Type me of the cr ason ea under act	Desh Raj Verma	50	Male	30	High School	6.2		Tube well			wheat, paddy,	Potato, Mustard			Average	50,000		25, 000	Sandy loam	Sugarcane			Flood		
	Particulars	Age	Sex	Experience in Farming (in years)	Education qualification	poi	(ha) Dry land					Major crops grown			Knowledge in water management	Average income of the farmer from crops	(Rs/ycar /ha)		Soil Type	Name of the crop	Season	Area under action research (ha)	Twee of invitable hoching on the stand	1) pe or miseanor mermiology used	

		Fina	l Report	t (2008-11)	
1150 - 1500 200 30,000	10,000 20,000 10	<u>5</u> 15	Skip furrow method	78 109200 - 60	2 6 Learned new Learnology will follow in Mit follow in Need more labour Knowledgeable and helpful
- - 2100 200 26,000	6,610 20,000 10	5	Irrigation at Critical Growth stages	70 101500 60 60	2
- - 1550 200 29000	10,000 19000 10	5	Irrigation at Critical Growth stages	75 105000 - 60	3 4 Learned the new technology Will follow in future Nil Knowledgeable and helpful
1875 One crop season 1600 200 30,000 30,000	11,350 11,350 10 10		Trash mulching	70 101500 - 60	4 6 Learned the new technology Will follow in futurc Non-availability of labour Knowledgeable and helpful
Capital cost (Rs/ha) Life of material Operational cost (Rs/ha) Dependencest (Rs/ha) Labour (Rs/ha) Colhers (Rs/ha) Dothers (Rs/ha)	Cost shared by implementing institution (Rs/ha) Cost shared by farmer (Rs/ha) ter used for crop Depth of	nurgation (uny No. of irrigations Depth of irrigation (cm) No. of irrigations	p related tech	العاد الحياي العاد الحياي العاد الحياي العاد الحياي الحياية العاد الحياي العاد الحياي الحياي العاد الحياي العاد الحياي	Number of farmer visiting the action research Number of farmers willing to adopt technology Lesson learned from the action research Follow-up in future Constraints faced Farmers opinion about implementing research team

	The surgering the	· Opper Gaugeur I Jami wegion	11010	-9mm ATT	מזוווממו ז	allinal failings of the location. 700 film	10,0411,011,	
Name of farmer Particulars	Shami ullah khan	Mohd. Taskeen	Abdul Bari	Malti Devi	Iqbal Ahamad	Shagir Khan	Bindra Bux Singh	Hari Shankar
Age	55	20	65	60		65	75	70
Sex	Male	Male	Male	Female	Male	Male	Male	Male
Experience in Farming (in 45 years)	45	Ð		30	35	45	60	45
Education qualification	Primary	High School	High School	Primary	Degree	High School	Inter- mediate	Degree
Irr	3.2	1.6	4	3.2	2	1.6	6.5	3.2
owned (ha) Dry land	;	;	-	÷	;		; , {	
Source of irrigation	Tube well	Tube well,	Tube well	Tupe well	Tube well	Tube well	Tube well	Tube well
	Sugarcane, Sugarc wheal, paddy, wheal.	Sugarcane, , wheat,	Sugarcane, orchard.	Sugarcane, mentha,	Sugarcane, paddv.	Sugarcane, paddy, wheat.	Sugarcane, paddv.	Sugarcane, paddv.
	Potato,	paddy,		paddy,	wheat,	0	wheat,	whea,
Major crops grown	Mustard	mentha		wheat,	musiard,		mentha,	mentha,
			mustard,	mustard	polato,		mustard,	musterd,
			potato	arhar,			potato, arhar	potato, arhar
Knowledge in water management	Average	Average	Good	Average	Average	Good	Average	Average
Average income of the	22,000	-23, 000	18000	19500	22000	19,000	20,000	21,000
farmer from crops (Rs/ycar /ha)								
Average income from non avriculture (Rs/vear)	1 000	2000			2000	2000		
Soil Type	Sandy loam	Sendy	Sandy loam	Sandy loam Sandy loam Sandy		Sandy loam	Sandy	Sandy
4	,	loam	,	,				loam
Name of the crop	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane Sugarcane		Sugarcane	Sugarcano
Season	Spring '08				Spring '08 Spring '08		Spring '08 Spring '08	Spring '0
Area under action research a)	1.00				1.00		1.00	1.00
Type of irrigation	Irrigation at	Irrigation	Skip furrow	Skip	Skip		Skip f	Flood
rectiliotogy asca	growth stages			method		interconnecting	method	Integration
		slages				channels.		

Name of State, District and Village: Uttar Pradesh, Sitapur, Maizuddinpur

						Fin	al Rep	ort (20	08-11)			
												04
1875	One crop	1825	225	1600	28,000	11,350	16,650	10		12	ю	Trash mulching
1150	One crop	1300	150	1150	36,000	10,000	26,000	12		12	ŋ	Skip furrow method of irrigation
11,,000	One crop	2300	300	2000	54350	30,350	24,000	 س	×	12	9	Ring pit meihod of planting
1150		1900	150	1750		10,000	24,000	12		12	 س	Skip furrow method of irrigation
1150		1800	150	1650		10,000	25,000	12	 	10	ى ب	Skip furrow method
1150		1300	150	1140	28,000	10,000	26,000	12	LO	12	9	Skip furrow method of irrigation
		2500	300	2200	32, ,000	6,610	25,390	10	<u>6</u>	12	6	Irrigation at critical growth stages
		- 1750	150	1600	32,000	6,610	24,400	10	ц. 	12	ę	Irrigation at critical growth stages
Capital cost (Rs/ha) -	Life of material	nal cost	Rs/ha)	(s/ha	t of en (Rs/ha)	E Cost shared by implementing institution (Rs/ha)	ed by (s/ha)	Water Depth of used for irrigation (cm)	so.	Depth of irrigation (cm)	S	Type of crop related technology

	Yield (t/ha)	100	86	130	100	75	112	100	88
eld anc d ue to esearch	Value of the main product	1,40,000	1,20,400	1,82,000	1,45,000	1,08,750	1,62,400	1,45,000	1,23,200
əwo	Value of the by- product	4,000	4,000	5,000	4,000	3000	4000	4000	3000
our	Yield under conventional irrigation (L/ha)	80	70	85	60	53	75 (60	50
Number of f research	Number of farmer visiting the action research	4	3	ſ	2	60	4	3	5
Number of I technology	Number of farmers willing to adopt technology	3	2	4	3	2	3	2	4
Lesson learn	Lesson learned from the action	Learned the	Learned the	Learned the	Learned	Learned		Learned	Learned
Teseatott		technology	technology	technology	technology	technology	technology technology technology	technology	technology
Follow-up in future	n fulure	Will follow in future	Will follow in future	Will follow in future	Will follow in future	Will follow in future	Will follow Will follow Will follow Will follow in future in future in future	Will follow in future	Will follow in future
Constraints faced	faced	Need technical expert support every time	Nil	LiN	Nil	IEN	Nil	Nil	Nil
Farmers opini research team	on about implementing	Knowledge- able and helpful	Helpful throughout the season	Knowledge- able and helpful	Helpful Helpful Willing throughout throughout ness to the season the season help	Helpful throughout the season	1.	Krrowled- geable and helpful	Knowled- geable and helpful

Particulars	Name of farmer ulars	Manjit Singh Singh	Gurmeet Singh	Kanahai Lal Sumeri Lal		Sarvjeet Singh	Ram Pal	Smt. Maharani
ı	Age	52	40	42	40		50	68
1i g	Sex	Male	Male	Male	Male	Male	Male	Female
gnitec	Experience in Farming (in years)	30	22	25	20	25	30	20
lıcı	Education qualification	High School	High School	Primary	Middle	Intermediate Intermediate	Intermediate	Illiterate
d the	Tolal area Irrigaled	2.5	2.5	1.5	2.5	3	2	2
d s	owned (ha) Dry land		ł		I			1
619	Source of irrigation	Tube well	Tube well	Tube well	Tube well	Tube well	Tube well	Tube well
arm		Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,
J/		wrieal, pauluy Irrenina,		W TIEEL,	w rieal,	wrieal,		w fiedly
ו: ופג	Major crops grown		wheat,	paddy,	mentha,		mustarce	mustarc,
musi arch			paddy, mustard	mustard	mustard	mustard, paddy	paddy	paddy
əsər ədə	Knowledge in water	Average	Average	Average	Average	Average	Average	Poor
u Je								
ails c actio	Average income of the farmer from crops (Rs/year /ha)	21,000	25,000	15,000	18,000	25,000	21,000	16,000
the Det	Average income from non avriculture (Rs/vear)	1						
	Soil Trues	Clay loam	Toam	Candw	Candw	Candy loam	Candy loam	Candy
u		Liay Ivalli	Thoall	Jainuy Ioam	Jainy Ioam	Jaliny Wall	Jailing IDalli	Joam
ioi.	Name of the crop	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane
	Season	Spring, 2008	Spring, 2008	Spring, 2008	Spring, 2008	80	Spring, 08	Spring 08
11 ło s 16929	Area under action research (ha)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	of irrigation technology	Skip furrow	Skip furrow	Irrigation at	Irrigation at Flood		Check basin method	Flood
D			noinain	F	growth		TIETING	
					stages			

Name of State, District and Village : Uttar Pradesh, Sitapur, Piprakalan

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	Car	Camital cost (Rs/ha)	1150	1150			1875	11.000	1875	
			0011	Oue case			0.00			
		Life of material	One crop season	One trop season	,	1	One urop season	One trop season	One trup season	
		Operational cost (Rs/ha)	1440	1440	2700	2500	1460		2720	
		Labour (Rs/ha)	300	300	300	300	320	320	320	
		Others (Rs/ha)	1140	1140	2400	2200	1140	2100	2400	
		Total cost of cultivation (Rs/ha)	35,000	35,000	33,000	32,110	30,000	54,350	29,000	
	of the fu	Cost shared by implementing institution (26./ha)	10,000	10,000	6,610	6,610	11,350	30,350	11,350	
-	pəsn	Cost shared by farmer (Rs/ha)	25,000	25,000	26,390	25,500	18,650	24,000	17,650	
	Water used for crop	d Depth of irrigation (cm)	7	7	10	10	10	5	10	
	under action research project	No. of irrigations	цŋ	ŋ	Ŧ	ŋ	Ŧ	2	4	
	Water used in	Depth of irrigation (cm)	10	10	10	12	10	10	10	
	conventiona l irrigation	No. of irrigations	5	5	5	9	ß	Ð	5	
	Type of cn	p related technology	Skip furrow	Skip furrow	Irrigation at	Irrigation at	Trash	Ring pit	Trash	
	4		irrigation		critical growth stares	critical grow th stares	Mulching	planting method	Mulching	
	Yield (Kg/ha)		106	100	105	106	100		90	
	Value of th		1,48,400	1,40,000	1,47,000	1,48,400	1,40,000	1,19,000	1,30,500	
put	Value of th	Svalue of the by- product	5000		5000		5,000	4,000	4,000	
	Yield under conve irrigation (Kg/ha)	er conventional (Kg/ha)	70	75	65	65	65		50	
Number	of farmer	Number of farmer visiting the action	4	4	4	4	3	5	1	
Number	of farmers	Number of farmers willing to adopt	3	5	5 5	3	2	4	3	
technology	By									
Lesson li	varmed fro	Lesson learned from the action research	Learned the new technology	Learned the	Learned the new technology	Learned the	Learned the	Learned the	Learned the	
			69	technology	0	technology	technology	nology	technology	
Follow-r	follow-up in future		Will follow in	Will follow in	Will follow in	Will follow in	Will follow in	W	Will follow in	
			future	future	future	future	future	uture	future	
Constrai	Constraints faced		Nil	Nil		IİN	Nfl	Nil	Nfl	
Farmers opini research team	opinion al team	Farmers opinion about implementing research team	Knowlcdgcablc and helpful	Knowlcdgcablc and helpful	Knowledgeable and helpful	Knowledgeable Knowledge and helpful able and	Knowledge able and	Knowledge able and	Knowledgeable and helpful	
							helpiul	helpful		

Annexure-V

Village-wise data for FPARP Evaluation (2009-10)

Name of State: Uttar Pradesh, District: Sitapur, Agro climatic zone: Upper Gangetic Plain Region Average annual rainfall of the location: 780 mm

													-													
Bhagvati Singh	(Bambhor)	55	Male	15	Intermediate	3.5	0.5	Tube well, pump set	Sugarcane, mustard, paddy, wheat, lentil	Average	25, 000	00000		Sandy loam	Sugarcane	Spring '09	1	Irrigation through	furrows made in	alternate rows	1200	One crop season	1400	200	1200	30,000
Ramesh Babu	(Bambhor)	35	Male	12	Graduate	3.5		Tube well, canal	Sugarcane, mustard pea, paddy, wheat	Poor	26, 000			Sandy loam	Sugarcane	Spring '09	1	Irrigating pits	through narrow	interconnecting channels	11,000	One crop season	2400	400	2000	55,000
Mulayam Singh	(Bambhor)	65	Male	40	Intermediate	6.0	0.5	Tube well, pump set	Sugarcane, wheat, potato, mustard, paddy, orchard	Average	27,000			Sandy loam	Sugarcane	Spring '09	1	Irrigating pits	through narrow	interconnecting channels	11,000	One crop season	2400	400	2000	55,000
gh	(Bambhor)	33	Female	10	Graduate	4.5		Tube well, canal	Sugarcane, wheat, 1 potato, mustard	Good	30, 000	10,000		Loam	Sugarcane	Spring '09	1	Irrigation through	furrows made in	alternate rows	1200	One crop season	1400	200	1200	30,000
Shiv Prakash	(Bambhor)	38	Male	15	Graduate	4.5		Tube well, canal	Sugarcane, wheat, potato, mustard	Average	30, 000	10,000	— 10,000 —	Loam	- Sugarcane	Spring '09	1	Irrigating pits	through narrow	interconnecting channels	11,000	One crop season	2400	400		55,000
Name of farmer and village Shiv Prakash	S	Age (year)	Sex	Experience in Farming (in years)	Education	Total area Irrigated	owned (ha) Dryland	Source of irrigation	Major crops grown	Knowledge in water management	me of th	-	Average income from non agriculture (Rs/vear)	Soil Type	Name of the crop	Season of planting	Area under action research (ha)	Type of irrigation technology			Capital cost (Rs/ha))ƏS		은 걸 Total cost of C 걸 cultivation (Rs/ha)
	Particulars	0.0	}uŗ	cipat	i J J	ed	\$1 9		антает. Алтает.							U	1c]	27)5	91	uoit	986	թղլ	ło eli	Bla	DQ	

	;					
	Cost shared by	31,000	10,000	31,000	31,000	10,000
	implementing					
	institution (Rs/ha)					
	Cost shared by	24,000	20,000	24,000	24,000	20,000
	farmer (Rs/ha)					
Water used	sed Depth of irrigation	8	10	8	8	10
for crop						
under		7	6	7	7	6
action	Mo of immoviations					
research	ING. OI IITTERUOUS					
project						
Water used	sed Depth of irrigation	10	12	12	12	12
in	(cm)					
convention al irrieation	ion No. of irrigations	6	6	6	9	6
Type of crop 1	crop related technology	Ring pit method	Skip furrow	Ring pit method of	Ring pit method	Skip furrow
T a	700 T	of planting	method of	planting	of planting	method of
		1	irrigation	;	;	irrigation
Yield (t/ha)	/ha)	160	120	145	152	102
ਨੂ ਕੇ ਉੱਤੂ Value of the r	(the main product	352000	264000	319000	334400	224400
Provide the provide of the providence of the pro	f the by- product		ļ			ļ
ip our		75	70	76	78	64
irrigation (t/)					01	77
οf	visiting the action	5	4	5	2	5
research						
Number of farmers willir technology	willing to adopt	7	10	9	ل س	10
Lesson learned from the	n the action research	obtain more	water saving by	obtain more yield	obtain more	water saving by
		yield by cane	applying water in	by cane planting in	yield by cane	applying water in
		sud nu guunnau	skip iurrows	puts will continue this	planung in plas	
routow-up in nuture						
		this practice in future	practice in fulture	practice in luture	practice in future	practice in future
Constraints faced		more labour	nil	more labour	more labour	nil
		requirement and		requirement and	requirement and	
		high cost		high cost	high cost	
Farmer's opinion about i	oout implementing	cooperative and	cooperative and	cooperative and	cooperative and	cooperative and
research team		receptive	receptive	receptive	receptive	receptive

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

ver	Average annual rai	l rainfall of	nfall of the location: 780 mm	on: 780 mı	u					
	Name of farmer a	ner and village		Syed Ali	Abdul Bari	Ahmad			kar	Shalendra
	/		(Maizuddin-	(Maizuddin-	(Maizuddin-	(Maizuddin-	(Maizuddin-	(Maizuddin-	Sharan	Verme
Parliculars	lars		pur)	(und	(Jund)	pur)	(Ind	pur)	Singh (Ghaila)	(Tikra)
	Age (years)		35	65	66	35	50	66	55	38
	Sex		Male	Male	Male	Male	Male	Male	Male	Male
forse	Experience in Farr years)	n Farming (in	14	38	50	16	28	46	30	18
	Education		-Intermediate Graduate		High School	Intermediate	Intermediate Intermediate High School		Post graduale	Post graduale
	Total area	Imigated	3.0	4.0	4	3.5		1.6		5.0
	owned (ha)	Dry land		1.0			0.5			
0	Source of irrigatio	gation	Tube well	Tube well, Pump set	Tube well	Tube well	Tube well	Tube well	Tube well, Canal	Tube well
	/	/	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,
т					orchard,	paddy,	-			paddy,
	_		paddy,	paddy,	paddy,	wheat,				wheat
T	Major crops grown	grown			wheat,	mustard,	muslard,	mustard,	mentha,	mentha,
			mustard,		d,	arhar	potato	polato	mustard,	muslard,
			garlic, Onion		potato				potato, arhar	polato, arhar
	Knowledge in wal management	n walcr t	Average	Average	Cood	Average	Average	Cood	ამ	Average
	Average income of farmer from crops	f the	28,000	25,000	24,000	28,000	26, 000	26, 000	26,000	25,000
	(Rs/year /ha) Average income fi agriculture (Rs/ye	a) ame from non Rs/year)	1 0,000	2000			20, 000	20, 000	25,000	
	/	/	/	/	/	/ /	/	/ / /		/

Name of State: Uttar Pradesh, District: Sitapur, Agro climatic zone : Upper Gangetic Plain Region

Soil Type	6	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam
Name o	Name of the crop	Sugarcane	Sugarcane	Sugarcane	Sugarcare	Sugarcane	Sugarcane	100	Sugarcane
Season		Spring '09	Spring '09		Spring '09		Spring '09		Spring '09
Area un (ha)	Area under action research (ha)	1.00	1.00		1.00		1.00		1.00
Type of technold	l'ype of irrigation technology used	Irrigating through furrows made in alternate rows	ltrigating pits through narrow interconnec- ting channels.	Hlood Method	Irrigating pits through narrow interconnec- ting channels.	Flood Method	Flood Method	Irrigating pits through narrow intercom- ecting channels	Irrigating pits through narrow interconnec- ting channels
	Capital cost (Rs/ha)	1200	11,000	1900	11,000	1900	1900	11,000	11,000
SY.	Life of malerial	One crop	One crop	One crop	One crop	One crop	One crop	One crop	One crop
olonn		scason 1400	scason 2400	scason 2000	scason 2400	scason 2000	2000	scason 2400	scason 2400
 [Dəq	(ks/ na) Labour (Rs / ha)	200	400	300	400	300	300	400	400
 uoj	2 H	1200		0	2000		1700		2000
16gir	Total cost of cultivation (Rs/ha)	30,000	55,000	28,000	55,000	28,000	28,000	55,000	55,000
ri ərli	Cost shared by	10,000	31,000	11,500	31,000	11,500	11,500	31,000	31,000
	institution (Rs/ha)								
əsn soʻj	Cost shared by farmer (Rs/ha)	20,000	24,000	16, 500	24,000	16, 500	16, 500	24,000	24,000
Water used	De	10	8	10	8	10	10	8	8
llor crop under action	ction								
research	No	6	7	5	7	5	5	7	7
project									
Water used in	sed Depth of irrigation (cm)	12	12	12	12	12	12	12	12
conventional	No	9	9	9	9	9	9	ß	6
Type of cro technology	p relz	Skip furrow method of irrigation	Ring pit method of planting	Trash Mulching	Ring pit method of planting	Trash Mulching	Trash Mulching	Ring pit method of planting	Ring pit method of planting

Details of the action research

	Yield (t/ha)	108	130	108	130	116	97	148	140
yield schor schor	Value of the main product	243000	286000	237600	286000	255200	213400	333000	315000
u b of (Value of the by- product								
ənp oue	Yield under conventional irrigation (t/ha)	65	72	65	76	64	60	72	78
Number of farn action research	Number of farmers visiting the action research	9	Ð	2	Ą	7	4	10	6
Number of farme adopt technology	Number of farmers willing to adopt technology	12	4	80	4	8	<u>-</u>	4	3
Lesson lea	Lesson learned from the action	water	obtain more Trash	Trash	obtain	Trash	Trash	Obtain	Obtain
research		saving by	yield by cane mulch in	mulch in	more yield	mulch in	ուսլեի յո	more	more yield
		applying	planting in	the field to	by cane	the field to	the field	yield by	by cane
		water in	pils	save water	c	save water	to save	cane	planting in
		skip			pils		water	planting	pils
		Ś						in pits	
Follow-up in future	in future		Will	Will	Will	Will	Will	Will	Will
		continue	continue this	continue to	continue	continue to	continue	continue	continue
		this	practice in	mulch	tihis	mulch trash	te mulch		this
		practice in	future	trash in	practice in	in ratoon	trash in	practice	practice in
		future		ratoon crop future	future	crop	ratoon	in future	future
							crop		
Constraints faced	s faced	nil	More labour	More	More	More labour More	More	More	More
			requirement	labour	labour	required for	labour	labour	labour
			and high	required	require-	collection	required	require-	require-
			cost	for	ment and	and	for	ment and	mentand
				collection	high cost	spreading	collection	high cost	high cost
				anter		OI NESSA	ande		
				spreading of trash			spreading of trash		
Farmers of	Farmers opinion about	cooperative	cooperative cooperative	cooperative	cooperative cooperative cooperative	cooperative	coopera-	coopera-	cooperative
implemeni	implementing research team	and	and	and		and	tive and	tive and	and
		receptive	receptive	receptive	receptive	receptive	receptive	receptive	receptive

	t apur)		loon			lle	'ne,		y arhar					
gion	Ramdatt (Kamiyapur)	40 Male	17 High school	2.0		Tube well	Sugarcane, paddy,	wheat,	potato, arhar		Average	26,000	5,000	
Plain Re	Pradip Singh Chauhan (Devipur)	48 Male	22 Graduate	4.0		Tube well, Canal	Sugarcane, paddy,	wheat, mentha	muslard,	potato, arhar, orchard	Good	30,000	5,00,000	
Gangetic	Ram kumar (Sankarpur)	55 Male	27 Inter-	<u>mediate</u> 11.0	1.0	Tube well, Canal	Sugarcane, paddy,	wheat, mustard	polato,	orchard, pea potato, arhar, orchard	Good	26, 000	20, 000	
: Upper	Adittya Nath (Janua)	lle	30 Graduate	6.0		Tube well	Sugarcane, paddy,	wheat,	polato,	реа	Good	28, 000	1,50,000	
latic zone	Devendra Nath (Kotra)	35 Male	11 Graduate	4.0	0.5	Tube well	Sugarcane, paddy,	wheat, mistard	arhar,	potato, pea	Average	25, 000		
Agro clin	Khalil Ahmad (Kamapur)	40 Male	22 Eighth	2		Tube well	Sugarcane, paddy,	wheat, mustard	polato		Good	26, 000	/	
tar Pradesh, District: Sitapur, Agro climatic zone : Upper Gangetic Plain Region infall of the location: 780 mm	Balram (Kamiyapur) 	le /	22 Intermediate	3.0	-	Tube well, Pump set	Sugarcane, wheat, paddy,	mentha, polato	/		Good	25, 000	/	
esh, Distri the locat	Ajay (Sankarpur)	40 Male	20 Eighth	2.0		Canal	Sugarcane, wheat,	paddy,	muslard	/	Average	25,000	5,000	
Name of State: Uttar Prade Average annual rainfall of	ne of farmer and village		Experience in Farming (in) years) ////////////////////////////////////	Irrigated	owned (ha) Dryland	Source of irrigation	/ / /	/	Major crops grown	/	Knowledge in water management	me of the crops ()	Average income from non agriculture (Rs/year)	
Name Avera	Nam			юдэе	əų		insqia	ittec	l sıə	тты\тэ	misi (ərli lo elti	Dets	

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

Soil Type Name of Season Area und	Lype		Sandv loam Sandv loam		Sandw loam	Candar loans	0			Cardy
<u>Nam</u> Seasc Area					in the second	Sandy loam Sandy loam Joandy	loam	Sandy loam loam		Joam
Seaso	Name of the crop		Sugarcane	Sugarcane		Sugarcane	Sugarcane Sugarcane		Sugarcane	Sugarcane
Area	uc		Spring '09	Spring '09	Spring '09	Spring '09	Spring '09	Spring '09	Spring '09 Spring '09	Spring '09
(ha)	Area under action (ha)	research				1.00	1.00	1.00	1.00	1.00
			Irrigating	Irrigating	Irrigating	Irrigating	Irrigating	Flood	Flood	Irrigation
T.v.v.	noise invited		pils	pils lhrough	pils	pils	pils	Melhod	Melhod	lhrough
t y Pu techr	type of intigation technology used		through	narrow inter-	through	through	through			channels
	וטוטצא אשבא		narrow	connecting	narrow	narrow	narrow			
		-	inter-		inter-	inter-	interco-			
			connecting	*	connecting	connecting	nnecting			
			channels.		channels.	channels.	channels.			
pa	Capital cos (Rs/ha)		11,000	11,000	11,000	11,000	11,000	1900	1900	
sn	I ife of material	ataria	One crop	One crop	One crop	One crop	One crop	One crop	One crop	
K 3			season	season	season	season	season	season	season	
olonn	Operationa (Rs/ha)	l cost	2400	2400	2400	2400	2400	2000	2000	1800
pəq	Labour (Rs	/ha)	400	400	400	400	400	300	300	200
uc	Others (Rs,	/ ha)	2000	2000	2000	2000	2000	1700	1700	1600
ទោះ	Total cost o	of (Pr./hr)	55,000	55,000	55,000	55,000	55,000	28,000	28,000	30,000
111		. 1			000					100
i ət	Cost shared by	ed by	31,000	31,000	31,000	31,000	31,000	11,200	0000/11	0,000
h ìo	implement institution	n (Ks/ha)								
leoD	Cost shared farmer (Rs,	d by /ha)	24,000	24,000	24,000	24,000	24,000	16, 500	16, 500	23,500
Wate	Water used Depth	th of	89	89	8	8	8	10	10	10
for crop	rop (cm)	ation								
unde	ction									
research	irch No. of	of	7	7	7	7	7	5	2	4
project		ations								
Wate	Water used Depth	of	12	12	12	12	12	12	12	12
in	irrigat (cm)	ation)								
CONV	conventiona		<u> </u>	 u	 u	<u> </u>	<u> </u>	<u> </u>	<u> </u>	د
l irrig	l irrigation irrigat	ions			6	0				0

Details of the action research

Type of crop related technology	Ring pit method of planting	Ring pit method of planting	Ring pit method of planting	Ring pit method of planting	Ring pit method of planling	Trash mulching	Trash mulching	Irrigation at Critical growth stages
d e f Vield (t/ha) d e f Value of the main	144 324000	164 369000	155 348750	170 382500	140 308000	<u>105</u> 319000	95 209000	102 229500
Product Value of the bv- product								
Yield under co irrigation (t/h	1 76	83	80	84	74	74	72	80
Number of farmers visiting the action research	10	8	8	10	15	4	10	6
Number of farmers willing to adopt technology	4	3	4	4	4	6	7	4
Lesson learned from the action	Obtain	Obtain more	Obtain	Obtain	Obtain	Trash	Trash	Saved one
research	more yield	yield by cane	more yield	more yield	more	mulch in	mulch in	irrigation
	planting in	pianung in pits	oy cane planting in	oy cane planting in	yieid by cane	save water	save water	water
	pits	4	pits	pits	planting in pits			
Follow-up in future	Will	Will	Will	Will	Will	Will	Will	Apply
	continue	continuc this	continue	continue	continue	continue to	continue	irrigalion
	this	practice in	this	this	this	mulch		only at
	practice in	future	practice in	practice in	practice	bytrash in	h in	critical
	future		future	future	in future	raloon crop	u	growth
Construction of the second	March	With the last	Manua	More	Mana	More	Mon	Stages
	labour	requirement	labour	labour	labour	labour	labour	
	require-	and high cost	require-	require-	require-	required	required	
	ment and		ment and	ment and	ment and	for	for	
	high cost		high cost	high cost	high cost	collection	collection	
	_	_				and	and	
						spreading	spreading	
						of trash	of trash	
Farmers opinion about	Coopera-	Cooperative	Coopera-	Coopera-	Coopera-	Coopera-	Coopera-	Coopera-
implementing research team	tive and	and	tive and	tive and	tive and	tive and	tive e and	tive and
	receptive	receptive	receptive	receptive	receptive	receptive	receptive	receptive

Irrigation through furrows Rajesh Kumar (Devkaliya) Sugarcane, wheat, polato, made in alternate rows Tube well, pu<u>mp se</u>t High school Sandy loam Sugarcane Spring '09 30,000-Male Good One crop season 35 3.0muslard, paddy 12 12001400Sugarcane, wheat, potato, muslard, Mentha, paddy Irrigation through Tube well, canal Intermediate Sugarcane Spring '09 channels Lal Ji (Majgawan) 30, 000 25,000 Loam Male 4.54022 Good 1800 Irrigation through Sugarcane, wheat, polalo, muslard Sugarcane Spring '09 Illiterate channels 10,000 26,000 Loam Male Jashir Singh 3.5 4518Tube well (Puraini) Average 1800Name of farmer and village Average income of the farmer from ype of irrigation technology used **Operational** cost Knowledge in water management Life of material Experience in Farming (in years) Area under action research (ha) Capital cost Irrigated Dry land Average income from non Rs/ha) (Rs/ha) (Rs) agriculture (Rs/year) Source of irrigation crops (Rs/ year /ha) Major crops grown Name of the crop Age (years) Sex owned (ha) Education otal area Soil Type Season pəsn 'yəət Cost of irrigation Particulars participating in the action research: Details of the farmer/farmers Details of the action research

Name of State: Uttar Pradesh, District: Sitapur, Agro climatic zone : Upper Gangetic Plain Region Average annual rainfall of the location: 780 mm Final Report (2008-11)

1200 200

1600 200

1600200

Labour (Rs/ha)

Others (Rs/ha)

63

		Total cost of	30,000	30,000	30,000
		cultivation (Rs/ha)			
		Cost shared by	6,500	6,500	10,000
		implementing institution (Rs/ha)			
		Cost shared by	23,500	23,500	20,000
		farmer (Rs/ha)			
Water used f	sed for	Depth of irrigation	10	10	10
crop under	der	(cm)			
action researd project	esearch	No. of irrigations	5	5	6
Water used i	sed in	Depth of irrigation	12	12	12
conventional	ional	(cm)			
irrigation	u	No. of irrigations	6	6	9
Type of crop		related technology	Irrigation at Critical	Irrigation at Critical	Skip furrow method
			growth stages	growth stages	of irrigation
👾 🚬 Yield (t/ha)	/ha)		105	106	112
e E c Value of	f the mai	n product	236250	238500	246400
p c c Value of	f the by-	product		1	
C & Tield un	nder conv	ලි දු අYield under conventional irrigation (t/ha)	70	70	66
Number of farmers v		siling the action	5	0	8
research					
Number of farmers v	ters willi	villing to adopt	5	5	9
technology					
Lesson learned from		the action research	saved one irrigation	saved one irrigation	water saving by
			water	water	applying water in
					skip furrows
Follow-up in future	ture		apply irrigation only at	apply irrigation only at	will continue this
			critical growth stages	critical growth stages	practice in future
Constraints faced	pa		nil	nil	nil
Farmers opinion about implementing	ı about i	mplementing	cooperative and	cooperative and	cooperative and
research team			receptive	receptive	receptive

Average	Average annual rainfall of the location: 787 mm	ation: 787 mr	н				
/	Name of farmer and village	Amrish Chand	Vitthal Sharma	Omprakash	Tung Nath	Raj Kumar	Vinod Kumar
Particulars		(Saidkhanpur)	(Saidkhanpur)	(Saidkhanpur)	(Saidkhan-	(Saidkhan-	(Saidkhan-
	/				pur)	pur)	pur)
	Age (years)	35	65	38	70	40	42
u	Sex	Male	Male	Male	Male	Male	Male
e actio	Experience in Farming (in ycars)	16	42	20	52	20	23
ւլ ո	Education	Intermediate	High school	High school	Primary	High school	Intermediate
ıi 8.	Total area owned Irrigated	1.0	4.0	1.0	2.0	1.5	2.5
ույս	(ha) Dryland						
sqibit	Source of irrigation	Tube well	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well
1: 1:		Currenting	Current	Current		Center	Cupacity
d sr br cl		bugartane, wheat, paddy.	sugartarie, wheat, paddy.	ougarcane, paddy. wheat.	baddv.	beddv.	ougarcane, paddv.
essə auı.		mentha,	mentha, potato			wheat,	wheat,
rsi' r	liviajor crops grown	mustard		onion,	mustard,	mustard,	mentha, urd
lam.				mentha, radish	mentha	mentha	
tsì er	Knowledge in water	Good	Good	Good	Poor	Poor	Good
lt ło eli	Average income of the farmer from crons (Rs/vear /ha)	40,000	35, 000	34, 000	27, 000	28, 000	35, 000
вłа	(mil mak levil edam inon						
De	Average income from non agriculture (Rs/year)					50, 000	
u e	Soil Type	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam
list tha toit	Name of the crop	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane
to ac	g Season	Spring '09	Spring '09	Spring '09	Spring '09	Spring '09	Spring '09

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region

65

Area under action r	on research (ha)	0.5	0.25	0.25	1.00	0.5	0.5
Type of irrigation to	on technology used	lrrigating pits through narrow interconnec- ted channels	Irrigating pits through narrow interconnec-	Irrigating pits Irrigating pits Irrigation through through through through narrow narrow narrow channels interconnec-interconnec- led channels led channels		Irrigation through channels	Irrigation through channels
9	Capital cost (Rs/ha)	11,000	11,000	11,000			
technology used	Life of material	One crop season	One crop season	One crop season			
	Operational cost (Rs/ha)	2400	2400	2400	1800	1800	1800
	Labour (Rs/ha)	400	400	400	200	200	200
	Others (Rs/ha)	2000	2000	2000	1600	1600	1600
	Total cost of cultivation (Rs/ha)	55,000	55,000	55,000	30,000	30,000	30,000
	Cost shared by implementing institution (Rs/ha)	31,000	31,000	31,000	6,500	6,500	6,500
	Cost shared by farmer (Rs/ha)	24,000	24,000	24,000	23,500	23,500	23,500
Water used for crop	Depth of crop under irrigation (cm)	8	8	8	10	10	10
action research proj	project No. of irrigations	7	7	7	4	4	4
Water used in	Depth of irrigation (cm)	12	12	14	12	12	12
conventional irrigal	rigation No. of irrigations	9	L)	9	6	9	9
Type of crop related	lated technology	Ring pit method of	Ring pit method of	Ring pit method of	Irrigation	Irrigation at critical	Irrigation at critical
		planting	planting			growth stages	growth stages

👾 😄 [Yield (t/ha)	162	130	140	79	78	75
E S Value of the main product	3,64,500	2,92,500	315000	177750	171600	165000
P. 5 9 Value of the by- product						
O g ʊ Yield under conventional irrigation	68	65	68	60	63	60
(1/ha)						
Number of farmers visiting the action research	100	10	20	6	13	5
Number of farmers willing to adopt technology	7	3	2	3	2 2	2
Lesson learned from the action research	Learned the	Learned the	Learned the	Learned	Learned the	Learned the
	new	new	new	the new	new	new
	technology	technology	technology	technology technology	technology	technology
Follow-up in future	Will follow in	Will follow in Will follow in Will follow	Will follow	Will follow Will follow	Will follow	Will follow in
	future	future	in future	in future	in future	future
Constraints faced	High initial	Need more	High initial	Nil	Nil	Nil
	cost & Need	labour	cost & Need			
	more labour		more labour			
Farmers opinion about implementing research	Willingness	Willingness	Willingness Helpful	Helpful	Helpful	Helpful
team	to help in the	to help in the to help in the	to help in the throughout throughout	throughout	throughout	throughout
	$\operatorname{comin}_{\mathcal{B}}$	coming	$\operatorname{comin}_{\mathcal{B}}$	the scason	the season	the season
	season	season	season			

Particulars Name of farmer and village Avdhesh Kumar Auma Praiash Singh Bhagve Particulars Age (years) Name of farmer and village Saidkhampuu) Gaidkhampuu) Gaidkhampuu) <t< th=""><th>Avera</th><th>ge ann</th><th>Average annual rainfall of the location: 787 mm</th><th>mm</th><th></th><th></th></t<>	Avera	ge ann	Average annual rainfall of the location: 787 mm	mm		
E (years) (Satdklanpur) (Satdklanpur) E (years) 42 30 E (years) 42 30 E (years) 15 30 Luration 1.5 30 Latare 1.5 30 Latare 1.5 2.5 Intermediate Intermediate Intermediate 1.5 Incod (ha) - - 2.5 Intermediate 2.5 Intermediate 1.5 Intermediate 1.5 Intermediate 1.5 Intermediate 1.5 Intermediate 1.5 Intermediate 1.15 Intermediate 1.15 <th></th> <th></th> <th>Name of farmer and village</th> <th>Avdhesh Kumar</th> <th>Atma Prakash Singh</th> <th>Bhagvati Prasad</th>			Name of farmer and village	Avdhesh Kumar	Atma Prakash Singh	Bhagvati Prasad
Age (verst) 42 50 50 Experience in Farming (in years) Male Male Male Male Experience in Farming (in years) 1.5 Male Male Male Total area 1.5 2.5 2.5 2.5 owned (ha) - 2.5 2.5 2.5 Major crops grown menthy, mustard mesthy, mest, mustard, mentha 2.5 Major crops grown mentha, mustard mustard, mentha 2.5 Major crops grown menthy, mustard mustard, mentha Maior crops grown Source of irrigation Source of irrigation Major crops grown Experiment Poor Average Knowledge in water management Poor Source of irrigation through (nurows in the stard), wheat, mustard Nowned (ha) - - - - Average Source Source - - Nowned (ha) - - - - - Nowned (ha) - - - -	Particu	lars		(Saidkhanpur)	(Saidkhanpur)	(Saidkhanpur)
Sex Male Male Experience in Farming (in years) 22 30 Experience in Farming (in years) 22 30 Experience in Farming (in years) 25 30 Detail arrain 1.5 2.5 30 Source of irrigation 1.5 2.5 30 Source of irrigation 1.5 2.5 2.5 Source of irrigation 1.5 2.5 2.5 Source of irrigation 1.5 2.5 2.5 Najor crops grown Experiment pathy (wheat, mediate med		Age (ye	ears)	42	50	60
Experience in Farming (in years) 22 30 Education Intermediate Intermediate Education 1.5 2.5 2.5 Total area 1.5 2.5 2.5 Source of irrigation Tube well. Canal Tube well. Canal Source of irrigation Tube well. Canal Tube well. Canal Source of irrigation Nowledge in water menagement Poor Knowledge in water menagement Poor Average Average income of the farmer from crops 28,000 35,000 Mane of the crop Sandy loarn Sagmon Name of the crop Sugmon Sagmon Senson Sandy loarn Sagmon If ype Sandy loarn Sagmon Senson Sagmon through furrows Sagmon If ype Capital cost (Rs/ha) 0.5 If point (Rs/ha) Decentional cost (Rs/ha) 0.5 If all or attract Decentional cost (Rs/ha) 0.5 If all or attract cows made in alternate rows 0.5 If all or attract Decentional cost of cultivation (Rs/ha) 0.00	:	Sex		Male	Male	Male
Education Intermediate Intermediate Total area 1.5 2.5 2.5 Source of irrigation 2.5 2.5 2.5 Source of irrigation 1.5 2.5 2.5 Source of irrigation 1.1.5 2.5 2.5 Major crops grown Enerthe, mustard, mentha Intermediate Major crops grown Enerthe, mustard, mentha Enerthe, mustard, mentha Major crops grown Source of itrigation Average income of the farmer from crops 28,000 Average income from non agriculture (Rs/year) 50,000 Endy Joan Endy Joan Soul Type Soul Uppe Sould through furrows Engarcane, 0,05 Mame of the crop Sugarcane Sould through furrows Engarcane, 0,05 Mame of the crop Sould through furrows Engarcane, 0,05 Engarcane, 0,05 Mame of the crop Sould through furrows Engarcane, 0,05 Engarcane, 0,05 Mame of the crop Sould through furrows Engarcane, 0,05 Engarcane, 0,05 Mame of the crop Sould through furrows Engarcane, 0,05 Engarcane, 0,05 Mame of the crop	yp.	Experie		22	30	42
Total area 1.5 2.5 2.5 owned (ha) - - - 2.5 Source of irrigation Tube well, Canal Tube well, Canal 2.5 Source of irrigation Tube well, Canal Tube well, Canal 1.9 Major crops grown Tube well, Canal Sugarcanc, paddy, wheat, Sugarcanc, paddy, wheat, mustard, mentha, mustard, menth, mustard, mentha, mustard, mentha, mustard, menth, m		Educati		Intermediate	Intermediate	Primary
Owned (ha) - - Tube well, Canal Tube well, Canal Source of irrigation Tube well, Canal Tube well, Canal Tube well, Canal Major crops grown Sugarcane, paddy, wheat, with mustard, mentha, mastard, masta		Total an		2.5	2.5	4.0
Bource of irripation Tube well, Canal Tube well, Canal Major crops grown Sugarcane, paddy, wheat, bugarcane, paddy, wheat, mustard, mentha, made in alternate rows, made in alte		owned	_			
Major crops grownSugarcane, peddy, wheat, nentha, muslardSugarcane, paddy, wheat, muslard, menthaKnowledge in water managementPoorAverageKnowledge in water managementPoorAverageAverage income of the farmer from crops28,000-(Rs/year/ha)Average35,000Soli LiypeSoli LiypeSandy loamSoli Liype of irrigation technology usedSugarcaneSugarcaneMare of the cropSugarcaneSugarcaneSoli Liype of irrigation technology usedIrrigation throwsSugarcaneDiane of the cropCapital cost (Rs/ha)0.5Diane of the cropSugarcane0.5Soli Liype of irrigation technology usedIrrigation throwsIf soli Cost shared by implementing0.50.5Obser (Rs/ha)12001900Obser (Rs/ha)20002000Diane of cost shared by implementing10,000India cost (Rs/ha)10,000Diane of cost shared by implementing10,000Diane of cost shared by implementing10,000Diane of cost shared by implementing10,000Diane free of cost shared by implementing10,000Diane of cost sharee (Bs/ha)10,000Diane of cost sharee (Bs/ha)10,000Diane of cost sharee (Bs/ha)10,000Diane of cost shareed by implementing10,000 <td></td> <td>Source</td> <td>of irrigation</td> <td>Tube well, Canal</td> <td>Tube well, Canal</td> <td>Tube well, Canal</td>		Source	of irrigation	Tube well, Canal	Tube well, Canal	Tube well, Canal
Major crops grownmentha, mustardmustard, menthaKnowledge in water menagementPoorAverageKnowledge in water menagementPoorAverageAverage income of the farmer from crops28,00055,000Ris/year/ha)Average50,00050,000Name of the cropSoul TypeSoul TypeSoul TypeSoul TypeSundy loamSoul TypeCarcopSundy loamSoul TypeCarcopSundy loamSoul TypeCarcopSundy loamSubgarcanc,Sundy loamType of irrigation through furrowsIrrigation through furrowsLabour (Rs/ha)DoeDoeDepartional cost (Rs/ha)10002000C dCost shared by implementing10,000Does tof cost shared by implementing10,000Does the crop seasonDoeDoes the crop seasonDoeC dCost shared by implementing10,000Does tof cost shared by implementing10,000Does the crop season11,500C dCost shared by farmer (Rs/ha)20,000Does the crop season10,000Does the crop season11,500Does the cost shared by farmer (Rs/ha)10,000Does the crop season10,000Does the cost shared by farmer (Rs/ha)10,000 <td></td> <td></td> <td></td> <td>Sugarcane, paddy, wheat,</td> <td>Sugarcane, paddy, wheat,</td> <td>Sugarcane,</td>				Sugarcane, paddy, wheat,	Sugarcane, paddy, wheat,	Sugarcane,
Knowledge in water management Poor Average A verage income of the farmer from crops 28,000 35,000 Rs/year / ha) Average 35,000 35,000 A verage income of the farmer from non agriculture (Rs/year) 50,000 Sandy loarn 35,000 Soll Type Sandy loarn Sandy loarn Sandy loarn Name of the crop Sugarcane Sandy loarn Sugarcane Name of the crop Stagarcane Sugarcane Sugarcane Scason C.5 0.5 Spring '09 Spring '09 Area under action research (ha) C.5 0.5 Spring '09 Spring '09 Type of irrigation through furrows Inrigation through furrows Inrigation through furrows Inrigation through furrows Inde to in material One crop season 1400 2000 Inde Eabour (Rs/ha) 1400 200 28,000 Inde Dest shared by implementing 10,000 1700 28,000 Inde Eabour (Rs/ha) 200 28,000 17,00 Inde I		Major c	rops grown	mentha, mustard	mustard, mentha	paddy, wheat,
Knowledge in water menagementPoorAverageAverage income of the farmer from crops28,00035,000Rs/year /ha)35,00035,000Average income from non agriculture (Rs/year)50,000-Soil TypeSandy loamSandy loamSoil TypeSandy loamSugarcaneName of the cropSugarcaneSugarcaneScasonC.5Spring '090.5Area under action research (ha)C.50.5Type of inrigation technology usedInrigation through furrows1900Life of materialOperational cost (Rs/ha)2002000Deretional cost (Rs/ha)200200028,000Cost shared by implementing10,00011,50011,500Cost shared by implementing10,00016,50016,500						mustard, montha
Average income of the farmer from crops $28,000$ $35,000$ $35,000$ Rs/year /ha)Average income from non agriculture (Rs/year) $8,000$ $35,000$ $-$ Soil TypeSoil TypeSandy loam $ -$ Soil TypeSoil TypeSugarcaneSugarcane, $-$ Soil TypeArea under action research (ha)Syngy loam $ -$ Name of the cropSeasonSpring '09Spring '09 $-$ ScasonCapital cost (Rs/ha) 0.5 0.5 0.5 Type of irrigation technology usedIrrigation through furrows 1700 1900 Labour (Rs/ha)Operational cost (Rs/ha) 0.00 200 Derational cost (Rs/ha) 0.00 200 0.00 Labour (Rs/ha) 0.00 0.00 0.00 Labour (Rs/ha) 0.00 0.00 0.00 Labour (Rs/ha) 0.00 0.00 0.00 Labour (Rs/ha) 0.000 0.000 0.000 Labour (Rs/ha) 0.000 0.000 Labour (Rs/ha) 0.000 0.000 Labour (Rs/		Knowle		Poor	Average	Poor
Restrict (Rs/year /ha)Average income from non agriculture (Rs/year) 50,000-Soul TypeSoul Type-Soul TypeSoul Type-Name of the cropSugarcameSugarcameName of the cropSpring '09Spring '09Season0.50.50.5Area under action research (ha)0.50.5Type of irrigation technology used12001900Lule of material0.60.60.6Lule of material0.0019002000Lule of material0.0010001000Labour (Rs/ha)0.00200011,500Cast shared by implementing10,00011,500Cast shared by implementing10,00011,500Cast shared by furtion (Rs/ha)20,00011,500		Averag		28,000	35,000	- 28,000
A verage income from non agriculture (Rs/year) 50,000-Soil TypeSandy loarmSoil TypeSandy loarmName of the cropSugarcaneSasonSugarcaneSasonSugarcaneSasonSpring '09Area under action research (ha)C.5Type of irrigation through furrowsIrrigation through furrowsType of irrigation technology usedIrrigation through furrowsType of irrigation technology usedDoe crop seasonType of irrigation technology usedDoe crop seasonDiffe of materialDoe crop seasonDoe crop season2000Cost shared by implementing10,000Distitution (Rs/ha)30,00Cost shared by implementing10,000Doe crop season28,000Doe crop season28,000Doe crop season28,000Doe crop season20,000Doe cost shared by implementing10,000Doe cost shared by farmer (Rs/ha)20,000Doe		(Rs/yea				
Soil TypeSandy loarnSandy loarnName of the cropSugarcaneSugarcaneSeasonSugarcaneSugarcane,SeasonSpring '09Spring '09Area under action research (ha)0.50.5Area under action research (ha)0.50.5Type of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology used12000.5Deration technology used0.60.01900Life of materialOne crop season1900Derational cost (Rs/ha)1200200200Derational cost (Rs/ha)1200200200Derational cost (Rs/ha)1200200200Derational cost shared by implementing10,00011,500Diffic of shared by institution (Rs/ha)20,00011,500Distitution (Rs/ha)20,00016,500		Averag	Ψ.	50,000		35,000
Name of the cropSugarcaneSugarcaneSeasonSpring '09Spring '09Area under action research (ha)5pring '09Spring '09Area under action research (ha)0.50.5Type of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology used0.50.5Type of irrigation technology used12001900Lafour (Rs/ha)0.00.02000Operational cost (Rs/ha)14002000Derational cost (Rs/ha)12002000Capital cost of cultivation (Rs/ha)200028,000Cost shared by implementing10,00011,700Cost shared by implementing10,00011,700Cost shared by farmer (Rs/ha)20,00011,500Cost shared by farmer (Rs/ha)20,00011,500		Soil Ty		Sandy loam	Sandy loam	Sandy loam
ScasonSpring '09Spring '09Area under action research (ha)0.50.5Type of irrigation technology used1.50.5Type of irrigation technology used1.70.5Type of irrigation technology used1.7001.700Type of irrigation technology used1.7000.5Type of irrigation technology used1.2001.900Lafour (Rs/ha)1.2000.60.6Derational cost (Rs/ha)1.4002.000Derational cost (Rs/ha)1.4002.000Derational cost (Rs/ha)2.0002.000Derational cost (Rs/ha)1.2002.000Derational cost (Rs/ha)1.0002.000Derational cost of cultivation (Rs/ha)2.0002.8,000Derational cost of cultivation (Rs/ha)2.0001.1,500Decot shared by implementing10,0001.1,500Decot shared by farmer (Rs/ha)2.0001.1,500Decot shared by farmer (Rs/ha)2.0001.6,500		Name o	of the crop	Sugarcane	Sugarcane,	Sugarcane,
Area under action research (ha)(.50.5Type of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology usedIrrigation through furrowsIrrigation through furrowsEapital cost (Rs/ha)1200One crop season1900Labour (Rs/ha)2002000300Eabour (Rs/ha)120020001700Cost shared by implementing10,00011,500Institution (Rs/ha)20,00011,500Cost shared by implementing10,00011,500Cost shared by farmer (Rs/ha)20,00016,500	ч	Season		Spring '09	Spring '09	Spring '09
Type of irrigation technology usedIrrigation through furrowsIrrigation through furrowsType of irrigation technology usedleringation through furrowsmade in alternate rowsCapital cost (Rs/ha)12001900Life of materialOperational cost (Rs/ha)1200Life of material00e crop season2000Labour (Rs/ha)2002000Cost shared by implementing10,00011,000Cost shared by implementing10,00011,500Cost shared by implementing10,00010,000Cost shared by farmer (Rs/ha)20,00011,500Cost shared by implementing10,00016,500Cost shared by farmer (Rs/ha)20,00016,500	ous	Area ur		0.5	0.5	1.0
Capital cost (Rs/ha)12001900Life of materialOne crop seasonOne crop seasonLife of materialOne crop seasonOne crop seasonOperational cost (Rs/ha)14002000Ohers (Rs/ha)2002000Ohers (Rs/ha)2001700Cost shared by implementing10,00011,500Institution (Rs/ha)20,00011,500Cost shared by implementing10,00011,500Cost shared by farmer (Rs/ha)20,00016,500	əsəı ı	Type of		Irrigation through furrows made in alternate rows	Irrigation through furrows made in alternate rows	Flood Method
Life of materialOne crop seasonOne crop seasonOperational cost (Rs/ha)14002000Operational cost (Rs/ha)14002000E byOthers (Rs/ha)200300Others (Rs/ha)120017700C of of others (Rs/ha)30,00011,500C of of others (Rs/ha)20,00011,500C of shared by implementing10,00011,500C of cost shared by farmer (Rs/ha)20,00016,500	ιοŋ		Capital cost (Rs/ha)	1200	1900	1900
Operational cost (Rs/ha)14002000Expour (Rs/ha)200300Expose to construct (Rs/ha)2001700Expose to construct on construction (Rs/ha)30,0001700Expose to cost shared by implementing10,00011,500Expose to cost shared by implementing10,00011,500Expose to cost shared by farmer (Rs/ha)20,00011,500	38	l		One crop season	One crop season	One crop season
Res Labour (Rs/ha) 200 300 EFT use Ohers (Rs/ha) 1200 1700 EFS Total cost of cultivation (Rs/ha) 30,000 1700 EFS Total cost of cultivation (Rs/ha) 30,000 17,000 EFS Total cost of cultivation (Rs/ha) 30,000 11,500 EFS institution (Rs/ha) 20,000 11,500 Cost shared by farmer (Rs/ha) 20,000 16,500	эųз	ioi	Operational cost (Rs/ha)	1400	2000	2000
If BSC:hers (Rs/ha)12001700PSTotal cost of cultivation (Rs/ha)30,00028,000CCost shared by implementing10,00011,500DCost shared by farmer (Rs/ha)20,00016,500	ło			200	300	300
PSTotal cost of cultivation (Rs/ha)30,00028,000Cost shared by implementing10,00011,500Einstitution (Rs/ha)20,00016,500Cost shared by farmer (Rs/ha)20,00016,500	slit		Others (Rs/ha)	1200	1700	1700
Cost shared by implementing10,00011,500BInstitution (Rs/ha)20,00016, 500	stə			30,000	28,000	- 28,000
Cost shared by farmer (Rs/ha) 20,000 [16, 500]	I		red by implementing n (Rs/ha)	10,000	11,500	11,500
			red by farmer (Rs/ha)	20,000	16, 500	16, 500

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region

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					Γ	in		Rej	oor	1 (20)	08-11)	
10	Ð	12 6	Trash mulching	65	1,43,000		60	7	7	Learned the new technology	Will follow in future	Nil	Knowledgesble and helpful
10	Ð	1 <u>2</u> 6	Skip furrow method of irrigation	77	1,73, 250		63	5	3	Learned the new technology	Will follow in future	Nil	Knowledgeable and helpful
10	Ð	6	Skip furrow method of irrigation	76	1,71,000		65	14	6	Learned the new technology Learned the new technology	Will follow in future	Nil	Knowledgeable and helpful Knowledgeable and helpful
Water used Depth of irrigation (cm) for crop	under action research No. of irrigations project	used Depth of irrigation (cm) tiona No. of irrigations tion	Type of crop related technology	Territoria (t/ha)	oduct	ਛੋਂ ਦੂੱ Value of the by- product	ional irrigation (t/ha)	the action research	Number of farmers willing to adopt technology	Lesson learned from the action research	Follow-up in future	Constraints faced	Farmers opinion about implementing research team

	Name of farme	rmer and village	Neelam	Dhanpal Singh	Mahendra Pralap	Rupesh Kumar
Particulars			(Udvalnagar)	(Ud vatnagar)	Singh (Ud vatnagar)	(Udvatnagar)
Aε	Age (years)		45	70	65	27
Sex	X		Female	Male	Male	Male
Ex	Experience in Farm	arming (in years)	20	50	40	10
Ed	Education		High school	High school	High School	Post Graduate
To	Total area Inr	Irrigated	2.0	10.0	3.0	3.5
мo	owned (ha) Dr	Dryland				
So	Source of irrigation		Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal
:4			Sugarcane, wheat,	Sugarcane, wheat,	Sugarcane, paddy,	Sugarcane, paddy,
_	Major crops grown		paddy, mentha,	paddy, mustard	wheat, mustard,	wheat, mustard,
əsə			mustard		mentha	mentha
	Knowledge in wale	ater management	Poor	Average	Average	Poor
Av	Average income of	e of the farmer from	26,000	30, 000	26, 000	26, 000
	crops (Rs/ycar /ha)	(
	Average income fro	from non		26,000	75,000	
	agriculture (Rs/year)	ar)				
So	Soil Type			Sandy loam	Sandy loam	Sandy loam
Na	Name of the crop			Sugarcane	Sugarcane	Sugarcane
Sei	Season		Spring '09	Spring '09	Spring '09	Spring '09
Ar	nder actio	on research (ha)	1.0	1.0	0.5	0.5
			Flood Method	Irrigation through	Irrigation through	Irrigation through
Ty	Type of irrigation technology used	echnology used		furrows made in	furrows made in	furrows made in
				allernale rows	allernale rows	allernale rows
	Capital co	cost (Rs/ha)	1900	1200	1200	1200
-	L,ife of	material	One crop season	One crop season	One crop season	One crop season
	a Operat	ional cost (Rs/ha)	2000	1400	1400	1400
əų;	E Sollabour	r (Rs/ha)	300	200	200	200
Jo	Dihers	(Rs/ha)	1700	1200	1200	1200
150	sino 11/2	Fotal cost of cultivation	28,000	30,000	30,000	30,000
D	J					

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region

Averä	Average annual rai	al rainfall of the location: 787 mm	787 mm		
		Name of farmer and village	Saroj Singh	Mata Badal Sinhg	Tej Bahadur Singh
Particulars	ulars		(Garhi Satrahi)	(Garhi Satrahi)	(Garhi Satrahi)
	Age (years)	(sta	32	35	65
	Sex		Female	Male	Male
ų	Experience in F	nce in Farming (in years)	11	18	12
arc	Education	uc	High school	Inter mediate	Graduate
n rese mers	Total area owned (ha)	sa <u>Irrigated</u> ha) Dryland	3.0		3.0
rsì ioit:			Tube well, Canal	Tube well, Canal	Canal
ie si Vier/			Sugarcane, wheat, paddy,	Sugarcane,	Sugarcane, wheat,
nrs) : U ni	Major crops gr	ops grown	mentha, mustard	wheat, paddy, mentha, muslard	paddy, mustard
ชิน อนุา	Knowledge in	dge in water management	Average	Average	Average
10 UBC	Average incom	income of the farmer from crops	28,000	30,000	30, 000
elin Jicip					
Dete	Average incom (Rs/vear)	income from non agriculture		-	10,000
	Soil Type	<u>, </u>	Sandy loam	Sandy loam	Sandy loam
	Name of the cr	f the crop	Sugarcane	Sugarcane	Sugarcane
	Season		Spring '09	Spring '09	Spring '09
цэ.	Area under act	der action research (ha)	1.0	1.0	1.0
reəs	Type of irrigati	irrigation technology used	Flood Method	Flood Method	Irrigation through
i LG					furrows made in
10					alternate rows
цЭI		Capital cost (Rs/ha)	1900	1900	1200
s ər	uc	Life of material	One crop season	One crop season	One crop season
(† J		Operational cost (Rs/ha)	2000	2000	1400
o sj		Labour (Rs/ha)	300	300	200
ist		Others (Rs/ha)	1700	1700	1200
Ъe		Total cost of cultivation (Rs/ha)	28,000	28,000	30,000
	lonr Ionr	Cost shared by implementing	11,500	11,500	10,000
		institution (Ks/ha) Cost shared by farmer (Rs/ha)	16, 500	16, 500	20,000

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region

								method	tion		-		al F	(ej	por	t (2	ew Mai	18-			le and	
10		9		12	9			Skip furrow method	of irrigation	65	143000		55		7	ŋ	Learned the new	technology	Will follow in fulure	Nil	ul Knowledgeab helpful	
10		5		$\frac{12}{12}$	9			Trash mulching		75	165000		60		7	60	Learned the new	technology	Will follow in future	Need more labour	Knowledgeable and helpful Knowledgeable and helpful	
10		5			9			${ m Trash}$ mulchin ${ m g}$		70	154000		60		6	IJ	Learned the new technology		Will follow in future	Nil	Knowledgeable and helpful	
Depth of irrigation (cm)			No. of irrigations	Depth of irrigation (cm)		No. of irrigations		related technology			nain product	yy- product	Yield under conventional irrigation	(t/ha)	itin ${f B}$ the action research	illing to adopt technology	he action research				t implementing research	
Water used	for crop	under action	research	Project Water used	in	conventional	irrigation	Type of crop relate		Yield (t/ha)	Value of the main	Value of the by- pr	Yield under c		Number of farmers visiting	Number of farmers willing	Lesson learned from the act		Follow-up in future	Constraints faced	Farmers opinion about imp team	
										ŗ	ielo i an	cor pur d	or or or)	Number	Number	Lesson le		Follow-u	Constrai	Farmers team	

Name of farmer and village Santi Devi Raj Kumari Bai (Bijapur) (Bijapur) (Bj	Age (years) 60 53 48	Sex Female Female Male	Experience in Farming 35 25 30 (in years)	Education Illiterate Illiterate Illiterate	Total area Irrigated 1.5 1.0 0.75	owned Dryland	rce of irrigation Tube well Canal t	ne, Sugarcane,	wheat, wheat,		mentha mentha, mustard, mustard, arhar	in water Average Poor	Average income of the 26,000 22, 000 27, 000	farmer from crops (Rs/vear /ha)	Average income from - - - -	ult	(Rs/ycar)	Soil Type Sandy loam Sandy loam Sandy		Name of the crop Sugarcane Sugarcane	Same Samina (10 Samina (10 Samina (10
Surendra Rajendra Bahadur Bahadur Singh (Bijapur) (Bijapur)	40	Male	16	ate High school	1.0	1	Tube well, Tube well, Canal Canal	ne,		it, wheat,	ard, mustard,	8c	00 26,500		<u> </u>			Sandy loam Sandy loam		rcane Sugarcane	out and any out
Indrajjt Singh (Bijapur)	57	Male	- 35	ol High school	1.5	1	Tube well, Canal		paddy,	wheat,	mentha	Average	28,000		_			49.4		Sugarcane	Snring '00
Ramdin Pal (Bijapur)	40	Male	20	High school	0.75	ļ	Tube well, Canal		paddy,	wheat,	mustard, arhar	Poor	24,500		_			Sandy		Sugarcane	Chrine '00
Sankar Bax Singh (Bijapur)	50	Male	30	High school	1.5	I	Tube well, Canal		paddy,	wheat,	mustard, lentil	Average	25,000					Sandy	_		Spring '09 Spring '09 Spring '09
Sitapati (Bijapur)	52	Female	30	Illiterate	1.0	Ţ	Tube well, Tube well, Canal Canal		wheat,	mustard,	mentha	Poor	25,000					Sandy loam		Sugarcane Sugarcane	Spring '09

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region Average annual rainfall of the location: 787 mm

$ \left \begin{array}{cccccccccccccccccccccccccccccccccccc$	Area ur	Area under action research	1.00	0.5	0.25	0.25	0.5	0.5	1.00	1.00
Itrigation Irrugation Irrugation Irrugation Irrugation Irrugation Irrugation ogy used furrough furough furough furough furough furough ogy used furough furough furough furough furough furough ogy used made in: made in: made in: made in: alternatic alternatic alternatic alternatic alternatic alternatic Capital cos: 1200 1200 1200 1200 Chartels channels channels channels fustorial brows rows rows channels Capital cos: 1200 1200 1200 1800 1800 Che crop Che crop One crop One crop Cone 200 Cis/hab 1400 1400 1400 1800 1800 Cis/hab 1200 200 200 200 200 Cost 200 200 200 200 200 Cost 30,000 30,000 30,000 30,000 Cost started by 10,000 10,000 20,000 23,500 Cost started by 10<	(ha)									
$ \left \begin{array}{cccccccccccccccccccccccccccccccccccc$			Irrigation	Flood						
ogy usedfurrowsfurrowsfurrowsfurrowsfurrowsfurrowschannelschannels $(apriate in made inmade inmade inmade inmade inmade inmade inmade in(apriate cost12001200120012001200(k/ha)(breate cost)costcostcostcostcostcostcostcost(k/ha)Cne cropcne cropcn$	Type of	irrigation	through	method						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	technol	ogy used	furrows	furrows	furrows	furrows	channels	channels	channels	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			made in	made in	made in	made in				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			alternate	alternate	alternate	alternate				
$ \left[\begin{array}{c c c c c c c c c c c c c c c c c c c $			rows	rows		rows				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Capital cost	1200	1200		1200	1			1900
		(bit /cvi)	C	C	C	C				C
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Life of material	Une crop	One crop	One crop	Une crop	1			Une crop
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	p		season	season	Season	Season				Seabon
Labour (Rs/ha) 200	əsn A30	lanc	1400	1400	1400		1800	1800	1800	2000
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	lond		200	200	200	200	200		200	300
	oot uc		1200	1200	1200	1200	1600	1600	1600	1700
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	oitegi	0	30,000	30,000	30,000				30,000	28,000
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ni e		10,000	10,000	10,000				6,500	11,500
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	in to	implementing institution (Rs/ha)								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	leoD	Cost shared by farmer (Rs/ha)	20,000	20,000	20,000				23,500	16, 500
be considered irrigation by the last of th			10	10	10	10	10	10	10^{-10}	10
h No. of b 6 6 6 4 4 4 b irrigations	Water u	inniga								
h No. of irrigations 6 6 6 4 4 4	for crop	1								
irrigations	unuer a	Icuon -	9	9	9		4	4	4	ц
	project	No. o irriga)))		1	1)

	_	Depth of irrigation	12	12	12	12	12	12	12	12
	irrigation	(cm) No. of	6	<u> </u>	<u> </u>	6	9	9	. 9	6
		irrigations								
	Type of crop relat	lated	Skip furrow	Skip furrow	Skip furrow	Skip furrow	Irrigation	Irrigation	Irrigation	Trash
	technology		method of	method of	method of	method of	at Critical	at Critical	at Critical	mulching
			irrigation	irrigation	irrigation	irrigation	_	_	growth	
							stages	stages	stages	
en F	Yield (1/ha)		75	65	80	95			80	80
olei mo	Value of the ma	iin product	165000	143000	176000	209000	198000	198000	176000	176000
y qo 2ni	Value of the by-	- product								i
Src	ថ្មី ជី Yield under conventional a lirrigation (t/ha)	rventional)	62	60	60	64	65	65	63	60
Num	Number of farmer visiti action research	iting the	5	9	8	Q	6	4	4	10
2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1										
Num	Number of farmers willi	illing to	4	e e	4	2	4	2	3	4
adop	adopi iechnology									
Lesso	esson learned from the	he action	Learned the	Learned the Learned the	Learned the	Learned the Learned	Learned	Learned	Learned	Learned the
research	rich					new	the new	the new	the new	new
			technology	technology	technology	technology	techno-	techno	techno-	technology
							logy	logy	logy	
Follo	Follow-up in future		Will follow	Will follow	Will follow	Will follow	Will		Will	Will follow
			in future	in future	in future	in future	follow in	follow in	follow in	in future
							future	future	future	
Cons	Constraints faced		INI	Need more	Inil	Nil	Nil	Nil	Nil	Nil
				labour						
Farm	Farmers opinion about	at	Knowled-	-			d-	Sc-	∋d–	Knowled-
imple	implementing research	h team	geable and	geable and	geable and	geable and	geable	geable	geable	geable and
			helpful	helpful	helpful	helpful				helpful
							helpful	helpful	helpful	

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

Village wise data for FPARP Evaluation (2010-11)	te: Uttar Pradesh, District: Sitapur, Agro climatic zone: Upper Gangetic Plain Region ual rainfall of the location: 780 mm	me of farmer and village Layeek Khan Iqbal Ahmad Ram Chandra Maya Devi Banke Lal (Kaimhara) (Maijuddinpur) Verma (Tikra) (Tikra) (Shankarpur)	ar) 38 52 64 42 68	Male Male Male Female Male	nce in Farming (in 15 30 40 15 35 ~~ 35 ~~	on High Shool High Shool Intermediate Eighth Fifth	aa Irrigated 2.16 0.8 4.8 1.4 3.24	ha) Dryland - - 0.5	of irrigation Tube well	Sugarcane, paddy, Sugarcane, wheat, wheat, lentil, wheat, lentil, paddy, wheat, wheat, polato, paddy, wheat, lentil mustard, polato, paddy, wheat, lentil mustard, polato, paddy, wheat, lentil mustard, wheat, lentil mustard, mustard, wheat, lentil mustard, lentil mustard, wheat, lentil mustard,	dge in water Good Average Poor Average	ps income of the farmer 40,000 25,000 40,000 36,000 35,000 ps (Rs/year /ha) 35,000 36,000 36,000 35,000	> income from non 38,000 1, 20,000 - - ure (Rs/year) - - - -	e Loam Loam Sandy loam Sandy loam Sandy loam	f the crop Sugarcane Sugarcane Sugarcane Sugarcane Sugarcane
	Name of State: Uttar Prac Average annual rainfall o	⁻ Name of farn	Age (year)	Sex	Experience in Farming (in years)	Education		owned (ha) Dryland	Source of irrigation	Major crops grown	Knowledge in water management	A verage income of the far from crops (Rs/year /ha)	Average income from n agriculture (Rs/year)	Soil Type	Name of the crop
	Name Avera	Particulars	:	ятсћ	on rese	ដ១ន ទ	ւր ո	i gnù	edia	r/farmers partic	iəmisi	əų jo s	Detail	sliste 911 j	

Season of planting Area under action		Shring '10				
Area under action			nr. gurrde	Spring '10	Spring '10	Spring '10
	ion research (ha)	1	1		1	1
Tvne of irrigation technoloov		Irrigation through	Irrigation	Irrigation	Irrigation	Irrigation through
used		'n	furrows			furrows made in
	2	alternate rows		de	de	alternate rows
			alternate rows	in alternate	in alternate rows	
0	Capital cost Ks/ha)	1200	1200	1200	1200	1200
tech. used [].if	ife of material (One crop season	One crop season (One crop (season s	One crop season	One crop season
Op (Rs)perational cost Rs/ha)	1400	1400	1400	1400	1400
Lal	abour (Rs/ha)	200	200	200	200	200
Oth	Others (Rs/ha)	1200	1200	1200	1200	1200
Toi cul (Rs	Fotal cost of ultivation (Rs/ha)	30,000	30,000	30,000	30,000	30,000
Co im ins (Rs	Cost shared by mplementing nstitution (Rs/ha)	10,000	10,000	10,000	10,000	10,000
Co	Cost shared by	20,000	20,000	20,000	20,000	20,000
<u> </u>	Depth of irrigation 10 (cm)		10	10	10	10
under action research No project	No. of irrigations	9	9	9	9	6
	Depth of irrigation (cm)	12	13	12	12	12
conventional irrigation	No. of irrigations	9	6	6	9	6

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

	Type of crop related technology	ed technology Skip furrow method of irrigation	Skip furrow method of irrigation	Skip furrow method of irrigation	Skip furrow method of irrigation	Skip furrow method of irrigation
0	Yield (t/ha)	94	75	159	158	97
eld & searc	Value of the main product	1, 97, 400	1, 53, 750	3, 33, 900	3,31,800	2,03,700
auc	Value of the by- product					
jour	Yield under conventional irrigation (t/ha)	20	62	70	73	70
Number	Number of farmers visiting the action research	2	10	200	7	10
Number of technology	Number of farmers willing to adopt technology	0	4	50	2	9
Lesson le	Lesson learned from the action research	water saving by applying water in skip furrows	water saving by water saving applying water by applying in skip furrows water in skip furrows		water saving by water saving by applying water applying water in skip furrows furrows	water saving by applying water in skip furrows
Follow-u	Follow-up in future	Will continue this practice in future	will continue this practice in future	will continue this practice in future	will continue this practice in future	will continue this practice in future
Constraints faced	nts faced	nil	nil	mil	nil	nil
Farmer's opin research team	Farmer's opinion about implementing research team	Knowledgeable and helpful throughout crop season	Knowledgeable and helpful throughout crop season	Knowledgeable and helpful throughout crop season	Knowledgeable Knowledgeable and helpful and helpful throughout throughout crop season crop season	Knowledgeable and helpful throughcut crop season

Age of termer and village Switchest, Total Smith Timolean Surga Moli Dev Remserve Ramsevie Ramsevie Particulars Name of farmer and village Switchest, Total Chan Smith Lai Passeviet Smith Passeviet Particulars Name of farmer and village Switchest, Total Chan Chan Chan Smith Passeviet Age (rems) 6 35 56 53 30 55 47 Sex Ennaite Male Male Male Male Male Male Education Illiteration Illiteration Betwarting (rid) 26 27 28 28 Total area Illiteration Illiteration Intervention Eighth Candaute Eighth 28 Total area Illiteration Intervention 1.4 3.6 2.4 3.2 2.8 Sexure of insignion Total area Intervention Eighth Candaute Eighth Passe Male Male Male Male Male Male Male Education Illiteration Intervention Eighth Candaute Eighth Sec Sec 2.4 2.4 3.2 1.0<	Nam	Name of State: Uttar Prades Average annual rainfall of t	tar Pradesh, District: Sitapur, Agro climatic zone : Upper Gangetic Plain Region infall of the location: 780 mm	Sitapur, / 780 mm	Agro clim	atic zone	: Upper G	angetic I	lain Regi	uo
me of farmer ard village Savirti Devi Samad Kann Trinohan Lal Surga Parada Malit Devi Ramswak Kann metric puri) (Bekhariya) (Parso Mality Benwar- Nama) Trino) (Benwar- Kannul) c metric metric Male Male Male Male Male c Fernale Male Male Male Male Male fernale Male fernale Male Male Male fernale Male fernale Male fernale Male fernale Male fernale Male fernale Male fernale Male fernale Male fernale Male fernal fernale Male fernale Male fernale fernal fernale		in timitint innitin squ								
Main Knam Knam Lat Prased (Berwariha) Tiha) (Ramkund) e (rears) e1 3.5 56 11 30 18 23 30 50 e (rears) E Emale Maie Maie Maie Maie Maie Maie e (rears) Female Maie Maie Maie Maie Maie Maie e (rears) Female Maie Eighth Craduatic Eighth Eighth Eighth Eighth Eighth scation Injegted 1.64 3.66 2.74 2.4 5.2 1.0 2.5 al ana Injegted 1.64 3.66 2.74 2.4 5.0 1.0 2.5 ned (ta) Dry land - 0.5 - 0.5 - - - al ana Inspired Nate Eighth Craduatic Sugarcano, Sugar	/	Name of farmer and village		Shamad	Samun	Trimohan	Surya	Malti Devi	Ramsewak	Ramesh
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		/	(Maizuddin-	Khan	Khan	LaL	Prasad	(Benwa-	Verma	Babu
	Partic	ulars	pur)	(Bakhariya)	(Parse-	(Majhig-	(Benwariha)	riha)	(Ramkund)	(Harsingh-
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$					hara)	awan)				pur)
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Age (years)	61	35	56	48		50		47
Experience in Farming (in years) 30 11 30 18 28 17 25 years) Education Illiterate Interate Interate Eghth Education 25 Yoans) Tobal area Ilriterate Interate Eghth Creduate Eghth 100 25 Youre of irrigation - 0.5 - - 0.5 - - Source of irrigation Interate Burp set 24 3.2 10 2.5 Source of irrigation - 0.5 - - - - - Source of irrigation Interest Burp well Tube well Tube well Tube well Tube well Tube well Source of irrigation Education Sugarcane, Sugarc		Sex	Female	Male	Male	Male	Male	Female	Male	Male
Years)Years)PrestryEducationIlliterateInterEighthCraduateEighthPrestEducationInterpleted1.643.66 2.74 2.4 3.2 1.0 2.5 Youre of intigatedI.64 3.66 2.74 2.4 3.2 1.0 2.5 Source of intigationTube wellTube wellTube wellTube wellTube wellTube wellSource of intigationSugarcane,Sugarcane,Sugarcane,Sugarcane,Sugarcane,Sugarcane,Source of intigationSugarcane,Sugarcane,Sugarcane,Sugarcane,Sugarcane,Sugarcane,Major crops grownNajor crops grownNeady,Wheat,Wheat,Wheat,Wheat,Wheat,Wheat,Major crops grownNeaegeCoodCoodCoodCoodCoodCoodMajor crops grownNeaegeSugarcane,Sugarcane,Sugarcane,Sugarcane,Sugarcane,Major crops grownNeaegeCoodAverageCoodCoodCoodKrowledge in waterAverageCoodAverageAverageCoodSo(00)So(00)Average income of the30,00035,00034,000AverageSo(00)So(00)So(00)So(00)Average income of theSo(00)35,00034,000AverageSo(00)So(00)So(00)So(00)Average income of theSo(00)35,00034,000AverageCoodCoo	:цэл	ence in Fa	30	11	30	18	28	17	25	18
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	gə	years								
$\label{eq:constraints} \begin{array}{ c c c c c c c c c c c c c c c c c c c$	səı uc	Education	Illiterate	Inter mediate	Eighth	Graduate	Eighth	Illiterate	Post graduate	Graduate
$ \frac{\text{owned}(\text{fla}) \boxed{\text{Dyy}} \text{Ind} - \qquad 0.5 - - - - - - - - - $	ictio	Ir	1.64	3.66		2.4		1.0		2.80
Source of irrigation Tube well	ຊ ອນ			0.5	-		0.5			
Najor crops grown Sugarcane, Su	() ui 3	Source of irrigation	Tube well	Tube well, Pump set	Tube well	Tube well	Tube well	Tube well	Tube well, Canal	Tube well
Major crops grown wheat, paddy, wheat, paddy, wheat, mustard, management Polato, mustard, management Polato, mustard, management Polato, 000 35,000 34,000 40,000 36,000 35,000 36	nite		Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,
Major crops grown mustard pacdy, mustard, wheat, mustard, mustard, mustard, wheat, mustard, mustard,	dio	/ /	wheat, paddy,	wheat,	paddy,	paddy,	paddy,	paddy,	Paddy,	paddy,
Major crops grown	цı		muslard	paddy,	wheat	wheat,	wheat,	wheat,	wheat,	wheat,
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ed s	Major crops grown	 _/	mustard,	_/	mustard,	mustard,	muslard,	lentil	lentil
Knowledge in waterAverageCoodLentil, onion, garlicmenthaKnowledge in waterAverageCoodCoodRenthaKnowledge in waterAverageAverageAverageCoodManagement30,00035,00034,00040,00040,000Average income of the farmer from crops (Rs/year)30,00035,00034,00040,000Average income from non agriculture (Rs/year)36,00075,00036,00036,00072,000Average income from non agriculture (Rs/year)Sandy loamSandy loamSandy loamSandy loamSandy loamagriculture (Rs/year)Sandy loamSandy loamSandy loamSandy loamSandy loamSandy loamagriculture (ropSugarcaneSugarcaneSugarcaneSugarcaneSugarcaneSugarcaneSugarcane	ian			lentil		Potato,	mentha	lentil,		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	utel					lentil, onion,		mentha		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$:/J					garlic				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	amtej	ΜU	Average	Cood	Cood	Average	Average	Cood	Cood	Average
farmer from crops (Rs/year /ha)farmer from crops (Rs/year)farmer	અપ		30,000	35, 000	34, 000	40, 000		36, 000		35,000
Average income from non36,00075,00036,00036,00072,000agriculture (Rs/year)Sandy loanSandy loanSandy loanSandy loanSandy loanaSoil TypeSandy loanSandy loanSandy loanSandy loanIoanaName of the cropSugarcaneSugarcaneSugarcaneSugarcaneSugarcane	t to el	er from crop								
Soil Type Control Sandy loam Sandy loam Sandy loam Sandy loam Sandy loam Sandy Sandy Sandy loam Sandy Sandy Sandy Name of the crop Sugarcane	Deta	from non vear)	36,000	75,000	36,000		36,000	36, 000	72, 000	2,40,000
0			Sandy loam	Sandy loam	Sandy	Sandy loam				Sandy
Name of the crop 5ugarcane Sugarcane Sugarcane Sugarcane Sugarcane Sugarcane Sugarcane		.,			loam			loam	loam	loam
		Name of the cro		Sugarcane	Sugarcane			Sugarcane	Sugarcane	Sugarcane

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

ç				040 . 0					04 . 0
Season		nr Burude	nt gunde	nr guirde	nr Suude	nr guude	nt guirde	or guirde	nr gunde
Area under action (ha)	research	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Type of irrigation	u	l	Irrigation	e	_	Flood		Flood	Flood
technology used		through channels	through channels	through channels	through channels	Method	Method	Method	Meth.od
Capi	Capital cost (Rs/ha)					1900	1900	1900	1900
	Life of material					do	do	One crop	One crop
						season	season	season	season
	onal cost	1800	1800	1800	1800	2000	2000	2000	2000
	Labour (Rs/ha)	200	200	200	200	300	300	300	300
	Others (Rs/ha)	1600	1600	1600	1600	1700	1700	1700	1700
	Total cost of cultivation (Rs / ha)	30,000	30,000	30,000	30,000	28,000	28,000	28,000	28,000
	Cost shared by	6,500	6,500	6,500 (6,500	11,500	11,500	11,500	11,500
te turpi o instil	implementing institution (Rs/ha)								
		23,500	23,500	23,500	23,500	16, 500	16, 500	16, 500	16, 500
Waler used	Depth of	10	10	10	10	10	10	10	10
for crop									
under action									
research		4	4	4	4	5	5	5	ß
project	irrigations								
Water used	Depth of	12	12	12	12	12	12	12	12
in	irrigation (cm)								
conventional		6	6	9	9	5	2	5	ß
irrigation	irrigations								
Type of crop relate	related	Irrigation at	Irrigation at Irrigation	Irrigation	Irrigation at '			Trash	Trash
ltechnology		critical		I		Mulching	Mulching	Mulching	Mulching
		growth stages		-	growth				
			stalges	states	stapes				

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(t/ha)	75	87.5	82	87	75	75	75	76
	1.53.750	250	8.100	8.100	7.500	3.750	7.500	1.92.700
Value of the by- p								
දි දී Irrigation (t/ha)	65	72	70	72	64	63	67	78
Number of farmers visiting the action research	9	7	8	4	7	7	10	6
Number of farmers willing to adopt technology	4	4	9	4	5	4	4	ŋ
Lesson learned from the action	water seving	water saving water	water		-н	Trash	Trash mulch	Trash
research	by applying water at	by applying water at	savıng by applying	by applying water at	in the field to save	mulch in the field to	in the field to save water	the field
	critical growth	critical	water at	critical	water	save water		to save
	stages only	growth	critical	growth				water
		stages only	growth stages only	stages only	_			-
Follow-up in future	Will continue	Will	Will	Will continue Will		Will	Will continue	continue
	this practice in	conlinue	continue in	this practice continue to	continue lo	continue io	to mulch	to mulch
	future	this practice future	future	in fuluxe	mulch trash	mulch	trash in	trash in
		in future			in ratoon	trash in	ratoon crop	ratoon
					crop	ratoon crop		crop
Constraints faced	nil	nil	nil	lin	More labour	More	More labour	More
	-			-		required	collection	required
					and	for	and	for
					spreading of	collection	spreading of	collection
					trash	and	trash	and
						spreading		spreading
						of trash		of trash
Farmers opinion about implementing	Co-operative	Co-	coopera-	cooperative	cooperative	cooperative	cooperative	coopera-
research team	and	operative	tive and		and	and	and	tive and
	knowledgeable	and	receptive	receptive	receptive	receptive	receptive	receptive
		knowled-						
		geable						

Name	Name of State-Uttar Pradesh, Nar Average annual rainfall-780 mm	ne of District- Sitapur, A	Agro climatic zone : Upj	Pradesh, Name of District- Sitapur, Agro climatic zone : Upper Gangetic Plain Region Mall-780 mm
Particulars	Name of farmer and village lars	Adilyanath (Bhagwanpur- Janua)	Ram Prasad (Benwariha)	Pradip Singh Chauhan (Devipur)
99	Age (years)	54	56	45
նսդ	Scx	Malc	Malc	Malc
вqi	Experience in Farming (in	25	22	22
oņ.	years)			
ıød	Education	Graduate	Intermediate	Graduate
SI	rigated	8.0	1.6	4.0
əuı.	owned (ha) Dryland			
	Source of irrigation	Tube well, Pump set ,Canal	Tube well, Pump set	Tube well, canal
	Maior crobs grown	Sugarcane, wheal, paddy,	Sugarcane, wheal, paddy,	Sugarcane, paddy, wheal,
	interest and the second	lentil, mustard	lentil, mustard	mustard, potato
si 9 s91	Knowledge in water	Good	Good	Good
	-	35,000	35, 000	42, 000
	from crops (Rs/year /ha)			
	Average income from non	2,00,000		
	agriculture (Rs/year)			
	Soil Type	Sandy loam	Sandy loam	Sandy loam
	Name of the crop	Sugarcane	Sugarcane	Sugarcane
ųэл	Season	Spring 10	Spring '10	Spring 10
(159)	Area under action research (ha)	1.00	1.00	1.00
səı u	Type of irrigation technology	Flood Method	Flood Method	Flood Method
оцо	Capital cost (Rs/ha)	1900	1900	1900
a 91	Life of material	One crop season	One crop season	One crop season
ti io		2000	2000	2000
) ទ[Rs/ha)			
i BJ	🗧 🔗 Labour (Rs/ha) 🦳	300	300	300
Ъ¢	🛱 🖞 Others (Rs/ha)		1700	1700
	영 또 한 년 C 또 한 (Rs/ha)	28,000	28,000	28,000

	Lost st implay		11,300	luc'II	11,500
	institu	institution (Rs/ha)			
	Cost sh (Rs/ha	hared by farmer	16, 500	16, 500	16, 500
	Water used	Depth of	10	10	10
	for crop	irrigation (cm)			
	under action research	No. of irrigations	2	2	2
	Water used	Depth of irrigation (cm)	12	12	12
	conventional irrigation	No. of irrigations	<u>د</u>	2	2
	Type of crop rel	elated technology	Trash mulching	Trash mulching	Irash mulching
	Yield (t/ha)		75	75	78
ielo I De	Value of the m	nain product	1,53,750	1,57,500	1,63,800
cou pue A d	Svalue of the by-	y- product			
or Cro	Yield under cor irrigation (t/ha	onventional a)	68	63	70
Number research	Number of farmers visi research	ting the action	10	8	12
Number of technology	Number of farmers will technology	lling to adopt	4	4	7
Lesson l	Lesson learned from the	ne action research	Trash mulch in the field to save water	Trash mulch in the field to save water	Trash mulch in the field to save water
Follow-1	Follow-up in future		Will continue to mulch trash in ratoon crop	Will continue to mulch trash in ratoon crop	Will continue to mulch trash in ration crop
Constrat	Constraints faced		More labour required for collection and spreading of trash	More labour required for collection and spreading of trash	More labour required for collection and spreading of trash
Farmers opini research team	Farmers opinion about research team	i implementing	Cooperative and receptive	Cooperative and receptive	Cooperative and receplive

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

Avera	Average annual rain		fall of the location: 787 mm	87 mm	ρ			ρ	þ
/	Name of farmer	and village	Madanlal	Radhey	Ram Avtar	Lila Singh	Rampal	Birendra	Sidhdhanath
	/)		Shaym	(Akbarpur)	(Said-	(Gangauli)	Bahadur	(Sisauna)
Particulars	llars	/		(Vir Ki Thermon)	. /	khanpur)		Singh (Dhamanuv)	
	A no (woare)	/	10		L L	50	60	1 Manual Variation J	60
/	Contractor			/		500 1010	1.		00 Mala
uo	Experience in Far voars)	rming (in	20		30	30	35 35	25 25	35
ре асц	Education		Intermediate	Middle	Middle	Middle	High school	Degree	Intermediate
l ni	Total area Ir	rigated	1.5	3.0	4.0	1.5	4.0	3.0	2.5
ชินเ	owned (ha) Dr	ryland							
icipat	Source of irrigatio	on	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal	Tube well, Canal
part			Sugarcane,	Sugarcane,	Sugarcane,	Sugarcane,			Sugarcane,
કાગ	Major crops grow	/ _	wheat, paddy,	wheat, paddy, wheat, paddy, paddy, wheat, wontha	paddy, wheal,	paddy, wheat	paddy, wheat	paddy, mustard	paddy, wheat
un	nut de la color		mustard		mentha	mustard.	mustard.	wheat.	mentha
st\r						mentha	mentha	mentha	
əmtel	Knowledge in wa management	ater	Average	Average	Average	Average	Poor	Average	Average
әц	Average income o	of the	35,000	32, 000	36, 000	38, 000	39, 000	42, 000	30, 000
	farmer from crop: /ha)	s (Rs/year	/	/	/	/	/	/	
R19U Teses	Average income l agriculture (Rs/y	from non rear)					1		72, 000
чэле ацт	Soil Type	/	Sandy loam	Sandy loam	Sandy loam	Sandy Ioam	Sandy loam	Sandy loam	Loam
	Name of the crop		Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane	Sugarcane
	Season				Spring '10	Spring '10		Spring '10	Autumn'09
	Area under action (ha)	n research	0.5	0.5	0.5	0.5	1.0	1.0	1.0

Name of State: Uttar Pradesh, District: Barabanki, Agro climatic zone : Upper Gangetic Plain Region

			Flood method	Flood method Flood method Irrigation	Irrigation	Irrigation	Flood	Flood	Irrigating
Type o	Type of irrigati	ion technology			through	through	Method	Method	pits through
used					de	furrows			narrow
					in alternate	made in			inter-
					rows	alternate			connecting
						rows			channels.
	Capital	al cost (Rs/ha)	1900	1900	1200	1200	Ľ		11,000
pəs	T ifo of	f matorial	One crop	One crop	One crop	One crop	1	-	One crop
n /			season	season	season	season			season
ദ്രംപ	Operat	tional cost	2000	2000	1400	1400	1800	1800	2400
lon	(Rs/ha)	a)							
ype	Labour	ır (Rs/ha)	300	300	200	200	200	200	400
əq u	Others	s (Rs/ha)	1700	1700	1200	1200	1600	1600	2000
oiti	Total (Fotal cost of	28,000	28,000	30,000	30,000	30,000	30,000	55,000
sgi	cultival	ation (Rs/ha)							
ni e	Cost sl	hared by	11,500	11,500	10,000	10,000	6,500	6,500	31,000
эų	imple	implementing							
ło	inslihul	ttion (Rs/ha)							
ļso	Cost s]	hared by	16, 500	16, 500	20,000	20,000	23,500	23,500	24,000
Э	farmer	r (Rs/ha)							
Water used	nsed	Depth of	12	12	10	10	14	14	8
for crop	p P	irrigalion (cm)					8		
under action	action								
research	4	No. of	Ð	5	5	I	1	V	7
project		irrigations							
Water used	used	Depth of	12	12	12	12	14	14	15
in		irrigation (cm)							
conventional	tional	No. of	6	6	6	6	6	6	6
irrigation	on	irrigations							
Type o	lype of crop rel	elated	Trash	Trash	1	Skip	Irrigation	Irrigation at	Ring pit
technology	logy		mulching	mulching	Method of	furrow	at critical	critical	method of
					Irrigation	Ļ	growth	growth	planting
						Irrigation	stages	stages	

Pield (t/ha)	70	70	75	70	70	75	130
e f o Value of the main product	1, 40, 000	1, 43, 500	1, 50, 000	1, 43, 500	1, 43, 500	1, 53, 750	2, 73, 000
P E S Value of the by- product							
දි පී ජ Yield under conventional irrigation (t/ha)	55	56	58	55	60	58	62
Number of farmers visiting the action 11 research		20	25	15	14	150	150
Number of farmers willing to adopt technelogy	<u>8</u>	10	10	9	10	50	10
Lesson learned from the action	Learned the	Learned the	Learned the	Learned	Learned	Learned the	Learned the
research	new	new	new	the new	the new	new	new
	technology	technology	technology	technology	technology technology	technology	technology, Obtained
	_	-	_		-		more yield
							by cane
							planung in pils
Follow-up in future	Will follow in	Will follow in	Will follow in	Will follow Will follow Will follow	Will follow	Will follow	Will follow
	future	future	future	in future	in future	in future	in future
Constraints faced	High initial	Need more	High initial	Nil	Nil	Nil	High initial
	cost & Need	labour	cost & Need				cost & Need
	more labour		more labour				more labour
Farmers opinion about implementing Have good	Have good	Willingness to	Willingness to	Helpful	Helpful	Helpful	Helpful
research team	knowledge	he	help in the	through-	through-	throughout	throughout
			coming	out the	out the	the season	the season
	technology,	season &	season	season	season		
	Willingness to heln in the	Helptul †hronohont					
	J	0			a a a a a a a a a a a a a a a a a a a		
	season						

Brajendra Kuwanr Singh Pal Singh Kachhwah (Kanwa) (Balwapur)	65 55 Male Male		High school High school 5.0	-	Tube well, Tube well,	ame,	wheat, larhar mentha	Average Good	34, 000 40, 000	1	Clay loam Sandy loam	Sugarcane Sugarcane Spring '10 Spring '10 o =
Raj Kumar Singh (Kanwa)	45 Male	25	Intermediate		Tube well, Canal	Sugarcane, paddy,	w heat, mustard, lentil	Average	37,500	1	Clay loam	Sugarcane Spring '10 1 A
Rajesh Kumar Singh (Kanwa)	42 Male	22	Intermediate 3.5		Tube well, Canal	Sugarcane, paddy, wheat,	mustard, Corriander, arhar	Average	36, 00)		Clay loam	Sugarcane Spring '10
Ram Milan Yaciav (Kanwa)	40 Male	20	<u>Middle</u> 1.5		Tube well, Canal	Sugarcane, wheat, Lentil,	mentha, mustard	Average	30, 000	1	Clay loam	Sugarcane Spring '10
Rampher Shukla (Budhnapur)	55 Male	35	Graduate 1.6		Tube well	Sugarcane, wheat,	paddy, mentha	Average	28, 000	1	Clay loam	Sugarcane Spring '10
Name of farmer and village ulars	Age (years) Sex	e in Farming (in	Education Total area	a) Dryland	Source of irrigation		Major crops grown	Knowledge in water management	Average income of the farmer from crops (Rs/year /ha)	Average income from non agriculture (Rs/year)	Soil Type	Shame of the crop Season
Particulars	uo	ре асп	1 ui S	uŋŧ	annerba	sd sıəu		he far	arch: arch:			elist9O 9ri1

Farmers' Participatory Action Research on Water Use Efficient Sugarcane Technologies

								Fl	na	l K	epa	m	(20	00	-11)							
																							-
Flood Method							1800		200	1600	30,000		6,500	-		23,500	14		 4		14		6
Flood Method				, ⊥,	 		1800		200	1600	30,000		6,500			23,500	14		 4		14		9
Flood Method							1800		200	1600	30,000		6,500			23,500	14		4		14		9
Irrigation through	furrows made	in alternate	rows	1200	One crop	season	1400		200	1200	30,000		10,000			20,000	10		5		14		2
Irrigation through 1	de	in alternate di	rows	1200	One crop (1400		200	1200	30,000		10,000			23,000	12		2		14 14		2
Irrigation through	furrows	made in	iate	1200	One crop	season	1400		200	1200	30,000		10,000			20,000	10		9		12		9
on technology				al cost (Rs/ha)	,		itional cost	a)	ır (Rs/ha)	s (Rs/ha)	cost of	ation (Rs/ha)	hared by	implementing	ution (Rs/ha)	hared by farmer a)	Depth of	irrigation (cm)	No. of	irrigations	Depth of	irrigation (cm)	No. of
Type of irrigation tecl	nsed			Capital cost	<u> </u>		So Operational	jo (Rs/ha)	ਦੁੱ Labour (Rs,	Cthers (Rs/		E cultivation	E Cost shared			5 Cost shared U (Rs/ha)	Water used for Deptl	nder	research	project	Wator used in		

		MOTINI AINC	skip turrow	skip turrow	Irrigation at	Irrigation at	Irrigation at
		method of	method of	method of	Critical	Critical	Critical growth
au		irrigation	irrigation	irrigation	growth stages	growth stages growth stages stages	stages
u	Yicld (t/ha)	70	72	65	62	65	65
10	Value of the main product	1, 40, 000	1, 44, 000	1, 30, 000	1, 24, 000	1, 30, 000	1, 30, 000
out	Value of the by- product						
Cro Trol Tiel	Yield under conventional	55	62	52	55	50	54
8	irrigation (t/ha)						
umber of fi	Number of farmer visiting the action	12	15	20	15	21	25
research							
umber of f	Number of farmers willing to adopt	7	6	11	7	13	12
technology							
esson learn	Lesson learned from the action research	Learned the	Learned the	Learned the	Learned the	Learned the	Learned the new
		new	new	new	new	new	technology
		technology	technology	technology	technology	technology	
Follow-up in future	n future	Will follow in Will follow in		Will follow in	Will follow in	Will follow in Will follow in Will follow in	Will follow in
		future	future	future	future	future	future
Constraints faced	faced	Nil	Need more	Nil	Nil	Nil	Nil
			labour				
irmers opii	Farmers opinion about implementing	Knowledge-	Knowledge-	Knowledge-	Knowledge-	Knowledge-	Knowledgeable
research team	u	able and	able and	able and	able and	able and	and helpful
		helpful	helpful	helpful	helpful	helpful	

60th Year of Dedicated Service to the Nation...





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