Brief account of technical achievements

Year: 2011-12

- Large scale demonstration of water management technologies in field crops in a pilot area of the *Astagam Piyat Mandali* situated in Navsari branch command of left bank of UKC on crop diversification and drainage technologies was carried out. Awareness about the significance of OSSD/CSSD has been created among the farmers of the command area as well as line departments of the state.
- Adoption of drainage technologies by the farmers by bearing 100 per cent cost of the system in 110 ha. Sugar cooperatives and Govt. of Gujarat is planning to take up CSSD project on large scale (1000 ha) in waterlogged and salt affected areas of UKC. Along with these MIS demonstrations in hilly areas (tribal areas) of South Gujarat on farmers' fields has been initiated during 2011-12
- Evaluation of methods of irrigation in oil palm, Based on 6 years of experimentation it has been established that drip method of irrigation at 1.0 PEF was found most suitable for getting higher FFB yield as well as net return in oil palm.
- Fertigation with banana pseudostem sap as a liquid fertilizer in onion, Application of sap at the rate of 1500 l/ha or 2000 l/ha through drip along with only 60 or 80 per cent of RDF in onion is more remunerative
- Planting geometry and mulching in watermelon has been conducted. The results shows that the planting geometry (paired row and normal) had no significant effect on fruit yield of watermelon whereas mulching with SPM (silver black plastic mulch) and BPM had pronounced effect on fruit yield. Both these mulches showed positive response on fruit yield of watermelon
- Rain water /canal waste weir water harvesting activity in Navsari Agricultural University campus on quality of ground water and level of water table was monitored for 6 years. The quality of ground water improved due to water harvesting and the effect was more pronounced in the vicinity of pond.
- Hybrid castor when grown during *rabi* season under drip method of irrigation in South Gujarat condition attain higher vegetative growth. Therefore, it is necessary to impose water stress during the vegetative growth period. experiment results showed that the , water stress imposed for a period of 20 days without mulching and 30 days with mulching starting from 50 per cent emergence of main spike stage of castor crop found beneficial for getting higher seed yield and net profit.
- Results indicated bed size of 75 cm top width followed by a 60 cm furrow with a 15 to 20 cm depth and three rows of turmeric with 135 cm lateral spacing is most suitable land configuration under South Gujarat conditions.
- Experiment on application of water in different layers of soil in drip irrigated mango orchard is in progress and the growth of mango tree in all the treatments is uniform and no significant different was observed due to different depth of application.

- The experiment on irrigation and fertilizer levels on yield and quality of sugarbeet was sown in the month of November 2011 and periodical soil, plant sampling and other growth parameters recording is in progress.
- Annatto bixa has not responded to higher regimes of irrigation as well as fertigation of N and K.

Transfer of technology

- Installation of piped subsurface drainage in water logged and salt affected fields of the farmers increased sugarcane crop yield by 60 to 105 t/ha along with improvement in soil properties.
- Organized four demonstrations of micro irrigation system with mulching technology in vegetable crop grown by tribal farmers (eastern hilly tract).

Year: 2012-13

Technology development

- Adoption of drip irrigation and fertigation of (N and K in 8 equal splits at weekly interval) + mulching with black plastic or black/silver mulch) could enhance fruit yield of water melon (summer) by 47% and save water up to 34%.
- Planting of sugarcane (drip irrigation) by pit method (soil with hard pan by keeping spacing of 1.75 m x 1.75 m between two pits recorded significantly higher cane yield (151 t/ha) as compared to paired row planted control (128 t/ha).
- Scheduling of irrigation at 0.8 PEF and mulching with black plastic in pigeon pea (*rabi*) increased seed yield (1730 kg/ha) by 62per cent and saved 15 per cent of irrigation water as compared to control.
- In drip irrigated banana, adoption of fertigation twice in a week @ 80% of recommended dose increased fruit yield by 43 per cent over surface irrigation control.
- The seed yield of castor (*rabi*) was increased by 11% due to fertigation @ 80% recommended dose of fertilizer and inter row spacing of 1.2m as compared to control (paired row planted).

Transfer of technology

- Installation of piped subsurface drainage in water logged and salt affected fields of the farmers increased sugarcane crop yield by 60 to 105 t/ha along with improvement in soil properties.
- Organized four demonstrations of micro irrigation system with mulching technology in vegetable crop grown by tribal farmers (eastern hilly tract).

Year: 2013-14

- An awareness about management of water logged and salt affected soils along with pressurized methods of irrigation was created among the farmers. They were also

educated about use of gypsum as sodicity is the major problem of pilot area in addition to water logging. Full technical guidance regarding subsurface drainage has been provided by this centre. As a result of these efforts, area under horticultural crop has increased and farmers are adopting CSSD technology.

- From the results of yield and economics, it is concluded that for achieving higher yield and net profit from pigeon pea (*rabi*), the crop is to be irrigated through drip at 0.6 PEF with laying of 50µ black plastic as mulch (BPM) with 56 per cent coverage area.
- Based on the yield and economics, it is concluded that for getting higher yield and net profit from *rabi* castor, crop should be sown at 2.4 m x 0.6 m spacing. Further, it should be fertilized with 160:40 kg N and P/ha. The 10 per cent dose of N and whole quantity of P should be given as basal and remained 90 per cent N is to be given through fertigation in 10 equal splits at an interval of 8-10 days starting from 15 DAS.
- The second year result indicated that individual effect of irrigation (I) and application of sulphure (S) were found to be significant on majority of growth and yield attributes as well as seed yield of summer cluster bean. In case of seed yield of cluster bean, treatment S_3 and S_2 out yielded than treatment S_0 and S_1 by recording significantly higher grain yield.
- Study on subsurface lateral having inline dripper of varying discharge rates and spacing's in sugarcane is under progress.
- In order to assess the knowledge, adoption level and problem faced by CSSD /OSSD farmers, standard questionnaires has been prepared and survey is in progress.
- **TSP:**
    - Cluster based MIS demonstration is given in tribal area (TSP) during the year under report, out of twelve (12) farmers three each grown bitter gourd and brinjal, two grown cowpea and one each grown little gourd, pointed gourd, rose and maize. Among the different crops, higher net income of Rs. 30,000 to 36,200 from 0.2 ha was realized with bitter gourd and brinjal crop.
    - For efficient utilization of rain water stored in rubber dam, 10 MIS demonstrations given in dam site areas on different vegetable crops. The Micro Irrigation System (MIS) was laid on the farmer's field and the farmers sown different vegetable crops and is in progress. The results will be reported in next year.
- From the results of the experiment, on feasibility of drip irrigation in summer paddy, variety V_1 (GNR-3) and among three lateral spacing, L_2 (60 cm) recorded significantly higher grain yield of paddy in comparison to their respective other levels. The treatment combination V_1L_2 recorded significantly higher grain yield than rest of the treatment combinations.
- During the year under report, in all drainage case studies in UKC area are in progress. On overall basis, they have reported about 40-50 per cent increase in crop yields. Apart from

yield increase, they also experienced early *vapsa* condition in fields which facilitate timely interculturing and thereby minimize weed and disease infestation.

- Based on four years of result, scheduling of irrigation at 0.8 IW/CPE fertilized with recommended dose of fertilizer (RDF) *i.e.,* 60:40:40 NPK kg/ha/year was found more effective in achieving higher production of annatto seed. while, under scarcity of irrigation water irrigation through drip at 0.2 PEF along with 80 per cent recommended dose of N and K through fertigation.
- In case of cane yield, treatment D_2 (135.7 t/ha) registered significantly higher yield as compared to treatment D_1, but remained at par with treatment D_3. Among the three spacing tested, treatment S_2 and S_1 remained at par with each other and both were significantly superior over treatment S_3.
- The differences among the treatments were not significant in growth parameter as well as fruit yield of mango. Though, yet applying water at 50 and 60 cm depth through drip recorded relative higher fruit yield than 30 and 40 cm depth treatments.
- The fruit yield followed the significant descending trend on L levels *i.e.* $L_3 > L_2 > L_1$ between the two frequency of fertigation, level F_2 recorded significantly higher fruit yield as compared to F_1. In case of control *v/s* rest analysis, treatment mean was better than drip and drip better than surface control.

Transfer of technology

- Installation of piped subsurface drainage in water logged and salt affected fields of the farmers increased sugarcane crop yield by 60 to 105 t/ha along with improvement in soil properties.
- Organized four demonstrations of micro irrigation system with mulching technology in vegetable crop grown by tribal farmers (eastern hilly tract).

Year: 2014-15

- An awareness about management of water logged and salt affected soils along with pressurized methods of irrigation was created among the farmers. They were also educated about use of gypsum as sodicity is the major problem of pilot area in addition to water logging. Full technical guidance regarding subsurface drainage has been provided by this centre. As a result of these efforts, area under horticultural crop has increased and farmers are adopting CSSD technology.
- From the results of yield and economics, it is concluded that for achieving higher yield and net profit from pigeon pea (*rabi*), the crop is to be irrigated through drip at 0.6 PEF with laying of 50µ black plastic as mulch (BPM) with 56 per cent coverage area.
- Based on the yield and economics, it is concluded that for getting higher yield and net profit from *rabi* castor, crop should be sown at 2.4 m x 0.6 m spacing. Further, it should be fertilized with 160:40 kg N and P/ha. The 10 per cent dose of N and whole quantity of P should be given as basal and remained 90 per cent N is to be given through fertigation in 10 equal splits at an interval of 8-10 days starting from 15 DAS.

- The second year result indicated that individual effect of irrigation (I) and application of sulphure (S) were found to be significant on majority of growth and yield attributes as well as seed yield of summer cluster bean. Treatment I_3 (0.8 IW/CPE) recorded significantly higher value of plant height, no. of branches/ plant, no. of pods/plant and grain yield as compared to treatment I_1 (0.4 IW/CPE), but it remained at par with treatment I_2 (0.6 IW/CPE) in all the cases, except no. of pods/plant where in treatment I_3 and I_2 differed significantly among themselves. Treatment S_2 recorded significantly higher value of no. of pods/plant as compared to treatment S_0 and S_1, but it was at par with treatment S_2. In case of seed yield of cluster bean, treatment S_3 and S_2 out yielded than treatment S_0 and S_1 by recording significantly higher grain yield.
    - Study on subsurface lateral having inline dripper of varying discharge rates and spacings in sugarcane is under progress.
    - In order to assess the knowledge, adoption level and problem faced by CSSD /OSSD farmers, standard questionnaires has been prepared and survey is in progress.
- Cluster based MIS demonstration is given in tribal area (TSP) during the year under report, out of twelve (12) farmers three each grown bitter gourd and brinjal, two grown cowpea and one each grown little gourd, pointed gourd, rose and maize. Among the different crops, higher net income of Rs. 30,000 to 36,200 from 0.2 ha was realized with bitter gourd and brinjal crop.
- For efficient utilization of rain water stored in rubber dam, 10 MIS demonstrations given in dam site areas on different vegetable crops. The Micro Irrigation System (MIS) was laid on the farmer's field and the farmers sown different vegetable crops and is in progress. The results will be reported in next year.
- From the results of the experiment, on feasibility of drip irrigation in summer paddy, variety V_1 (GNR-3) and among three lateral spacing, L_2 (60 cm) recorded significantly higher grain yield of paddy in comparison to their respective other levels. The treatment combination V_1L_2 recorded significantly higher grain yield than rest of the treatment combinations. With respect to control v/s rest analysis, only treatment V_1L_2 (GNR-3 at 20x20x40 cm spacing) recorded significantly higher yield as compared to control-I (GRN-3-Flood irrigation). In case of control -II v/s rest analysis almost same trend was observed.
- During the year under report, in all drainage case studies in UKC area are in progress. The results indicated considerable increase in crop yield due to installation of CSSD under different situations. On overall basis, they have reported about 40-50 per cent increase in crop yields. Apart from yield increase, they also experienced early *vapsa* condition in fields which facilitate timely interculturing and thereby minimize weed and disease infestation. This activity will be continued, so as to create more awareness about water logging and salinity problems among the farmers of command areas.

- Based on four years of result, scheduling of irrigation at 0.8 IW/CPE fertilized with recommended dose of fertilizer (RDF) *i.e.,* 60:40:40 NPK kg/ha/year was found more effective in achieving higher production of annatto seed. while, under scarcity of irrigation water irrigation through drip at 0.2 PEF along with 80 per cent recommended dose of N and K through fertigation.
- Growth and yield attributes were found to be significantly influenced due to the pit diameter except average cane weight and yield. Wherein, significantly higher yield was recorded with treatment D_2 than D_1 but it remained at par with D_2. In case of different pit spacing (S), girth of internode, length of internodes and sugarcane yield were influenced significantly. Treatment S_2 recorded significantly higher cane yield as compared to treatment S_3 but it remained at par with treatment S_1.
- The differences among the treatments were not significant in growth parameter as well as fruit yield of mango. Though, yet applying water at 50 and 60 cm depth through drip recorded relative higher fruit yield than 30 and 40 cm depth treatments.
- Based on the results of experiment on comparative performance of water soluble and routinely used fertilizer in banana (cv. Grand Naine) under drip irrigation, among the fertilizer levels, L_3 (80 % RD) recorded significantly higher values of all these attributes as compared to L_2 and L_1. As far as effect of frequency of fertilizer application is concerned it was found to be significant on all the attributes except no. of hands per bunch. In all the cases, F_2 (twice in a week) frequency of fertigation recorded significantly higher values. The fruit yield followed the significant descending trend on L levels *i.e.* $L_3 > L_2 > L_1$ between the two frequency of fertigation, level F_2 recorded significantly higher fruit yield as compared to F_1. In case of control *v/s* rest analysis, treatment mean was better than drip and drip better than surface control.

  Banana Pseudostem Value Chain:

  - Successfully completed banana pseudostem project funded by ICAR with all the objectives
  - Developed commercial technologies and patented
  - More than 8 MoU done for the commercial production and marketing of value added products from banana pseudostem *viz.* Organic liquid fertilizer, Central core candy *etc.*

Important publication published by SWMRU, NAU, Navsari

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2. Natural Resources of Gujarat (Agro ecological database for regional planning) SWMP Pub. 11. (2000).
3. Water Management Technologies- A Compilation (1980-2005), SWMP. Pub. 12, SWMRU, NAU, Navsari (Gujarat) (2006).
4. Water and food Security Scenario Analysis for 2025- Agroecological Region-2 (2007) SWMP. Pub. 13
5. Management of water logged and salt affected soils through micro irrigation and subsurface drainage (2008). SWMP Pub. 14
6. Precision Farming Development Centre, NAU, Navsari – At a glance (2008). SWMP Pub. 15
7. Talim Pustika: Adhunic Piyat Padhati (2008). SWMP Pub. 16
8. Soil and Water Management Research Unit, NAU, Navsari – At a glance (2008). SWMP Pub. 17
9. Drainage (2008). SWMP Pub. 18
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11. LCGH (2008). SWMP Pub. 20
12. Management of Water Resources in Gujarat (2009), SWMP pub.21
13. Micro irrigation and fertigation scheduler of potato in Gujarat (2009). SWMP pub.22
14. Low cost green house is a protected cultivation (2009)
15. Water resource and its Management (Question and its Solution) (2009).
16. Water resource and its Management (Question and its Solution) (2009)
17. Water management technologies – A compilation (1980 to 2012), Year 2012

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1. Drainage design for the Ukai Right Bank Canal Command. SWM IDNP Tech. Bulletin No. 15, Soil and Water Management Project, G.A.U., Navsari (2001).
2. Report on Conveyance losses study. SWM IDNP Tech. Report No. 6, Soil and Water Management Project, G.A.U. , Navsari(2001).
3. Report on Water Balance Study. SWM IDNP Tech. Report No. 4, Soil and Water Management Project, G.A.U. , Navsari(2001).
4. Salt and Water Balance Study at Segwa Pilot Area. SWMP Tech. Report No. 8. Soil and Water Management Project, G.A.U., Navsari(2001).
5. Well Irrigation In Sugarcane- A Case Study of Segwa Pilot Area. SWM IDNP Tech. Report No. 9, Soil and Water Management Project, G.A.U. , Navsari(2001).
6. Drip irrigation in Sugarcane. SWMP Tech. Report No. 7, Soil and Water Management Project, G.A.U. , Navsari(2001).

7. Sub surface drainage strategies to combat water logging and salinity in canal commands of Gujarat, IDNP team, SWMRU, GAU, Navsari (2003).
8. Drip irrigation (folder), SWMRU, GAU, Navsari (2003).
9. Sprinkler irrigation (folder), SWMRU, GAU, Navsari (2003).
10. Modern method of banana cultivation (English & Gujarati), SWMRU, NAU, Navsari (2004).
11. Modern method of tomato cultivation (English & Gujarati), SWMRU, NAU, Navsari (2004).
12. Use of plastic in Agriculture (lecture note), SWMRU, NAU, Navsari (2004).
13. Accomplishment of AICRP on Water Management (2009)