an AICRPDA compendium

Research Publications and Recommendations in Dryland Agriculture

Annotated Bibliography 1971-2002

Central Research Institute for Dryland Agriculture
Hyderabad

Citation: AICRPDA. (2003). Research Publications and Recommendations in Dryland Agriculture; An Annotated Bibliography of 1972-2002. An AICRPDA contribution. Compiled by KPR Vittal, HP Singh, GR Maruthi Sankar, G Ravindra Chary, T Sri Jaya and Vibha Srivastava. All India Coordinated Research Project, Central Research Institute for Dryland Agriculture, Hyderabad 500 059, Andhra Pradesh, India. 85 pages.

About this compendium . . .

The All India Co-ordinated Research Project for Dryland Agriculture network started functioning from 1971 with head quarters at Hyderabad, Andhra Pradesh. There were twenty-three centers to start with, but consolidated to twenty-two centers at present. There are more than one hundred scientists from different disciplines, which distinguish this project from others. The centers cover eight crop(s) based production systems, almost all soil orders and climatic regions from arid through semi arid to sub-humid. The scientific publications and recommendations are the primary indicators of success of any mission-oriented project in meeting the clientele needs.

At present a compilation of annotated bibliography showed more than a thousand publications in scientific journals. Other popular articles, book contributions, presentations etc. were not considered. The general trend of publications was increase to a plateau at present. Among the centers Indore, Rajkot, Bangalore, Solapur, Bijapur, Ranchi, Phulbani, Kovilpatti cover seventy per cent of the publications with Indore as the topnotch publisher covering thirteen per cent of the total. An index is made on programs and issues in which publications are made. The work on cropping system increased with time. Research on rainwater management has decreased as expected. Little change in integrated nutrient management was noticed.

Cover: Greening the grey areas

Cover design: KVGK Murthy and I Ram Mohan

an AICRPDA compendium

Research Publications and Recommendations in Dryland Agriculture

Annotated Bibliography 1971-2002

KPR Vittal
HP Singh
GR Maruthi Sankar
G Ravindra Chary
T Sri Jaya
Vibha Srivastava

All India Coordinated Research Project for Dryland Agriculture
Central Research Institute for Dryland Agriculture
Hyderabad 500 059

2003

Compiled by
KPR Vittal
HP Singh
GR Maruthi Sankar
T Sri Jaya
Vibha Srivastava

Technical assistance by
A Girija
G Premkumar

Secretarial assistance by
G Varalakshmi
BVM Sastry
RD Dinesh

Supported by
SR Singh, Varanasi
SPS Chauhan, Agra
Bhagwan Singh, Faizabad
JS Jamwal, Rakh Dhiansar
S Subbaiah, Kovilpatti
PC Senapati, Phulbani
A Rafey, Ranchi
DR Padmani, Rajkot
SK. Gupta, Rewa
MM Patel, SK. Nagar
AR Bangar, Solapur
DG Giri, Akola
PM Jain, Arjia
T Yellamanda Reddy, Anantapur
MA Shankar, Bangalore
MB Guled, Bijapur
DS Jatasra, Hisar
Sukhwinder Singh, Ballowal-Saunkhri
RA Sharma, Indore

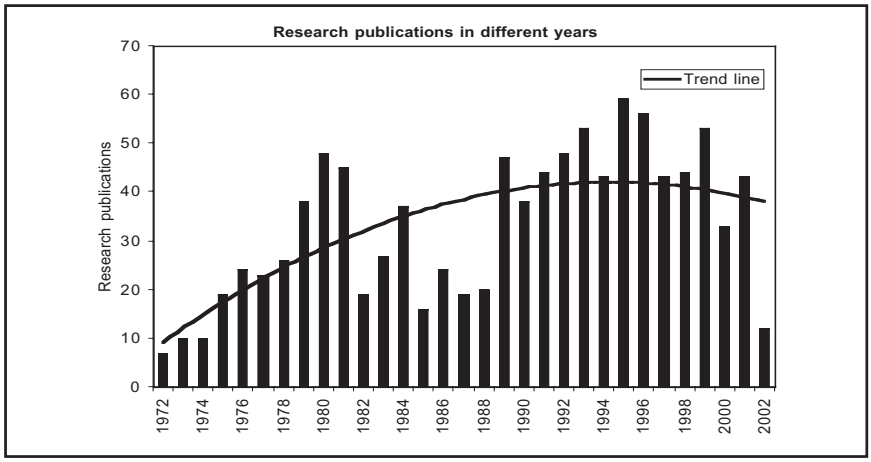
Published by
All India Coordinated Research Project for Dryland Agriculture
Central Research Institute for Dryland Agriculture
Santoshnagar, Hyderabad 500 059

Printed at : Venu Enterprises, Hyd. ✆: 27661538

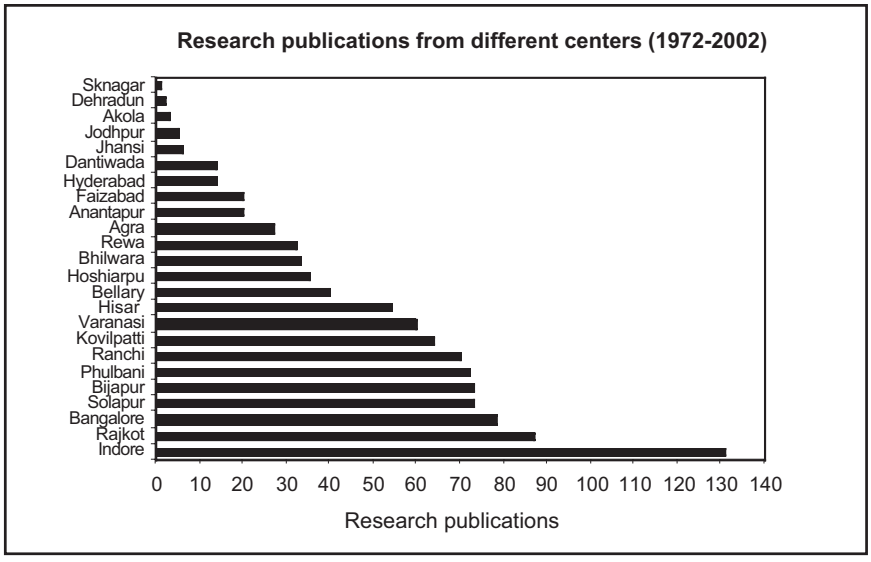
Contents

1. Introduction

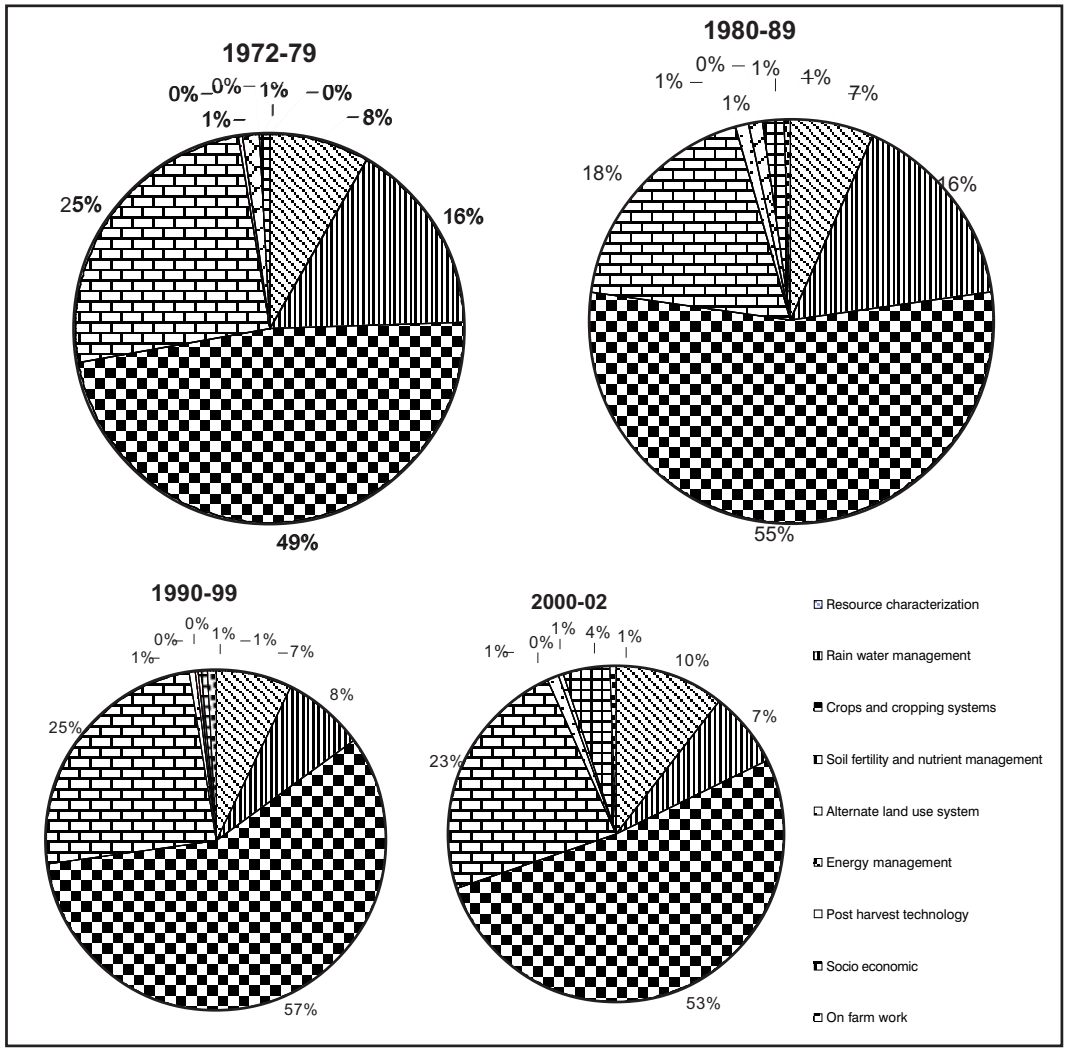
An annotated bibliography of the research publications, is prepared for the period ending 2002 since inception of the All India Co-ordinated Project for Dryland Agriculture in 1971. There are a total of 1002 publications from various centers during this period. We believe that there can be other publications unquoted, the limitations being non-availability of information. The centers also include those in the network but later on either discontinued or shifted location to other places. From 23 centers at start, now the network has only 22 centers. These include the centers from State Agricultural Universities, Technical Universities and ICAR institutes. During this period, there were two peaks in number of publications: one during 1980-81 and other in 1995-96. However the general trend was quadratic with plateau at present.



Among the various centers the topnotch publishers are Indore, Rajkot, Bangalore, Solapur, Bijapur, Ranchi, Phulbani, Kovilaptti, Varanasi. These almost cover 70% of the publications.

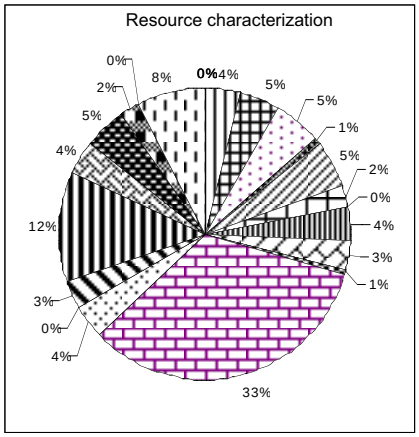


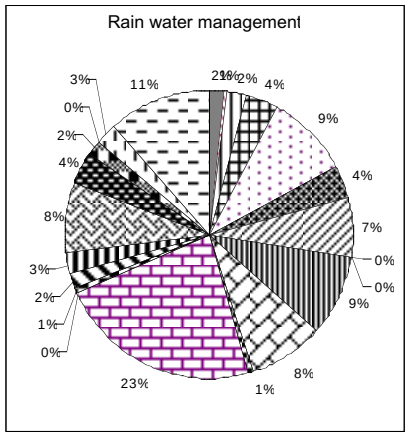
The publications are divided into nine programmes - resource characterization, rainwater management, crops and cropping system, soil fertility and nutrient management, alternate land use systems, energy management, post-harvest technology, socio economics and on-farm work. Among the various programs, the top four from which the publications take a lion's share are crops and cropping systems, soil fertility and nutrient management, resource characterization, Rainwater management. It is seen that crops and cropping system increased

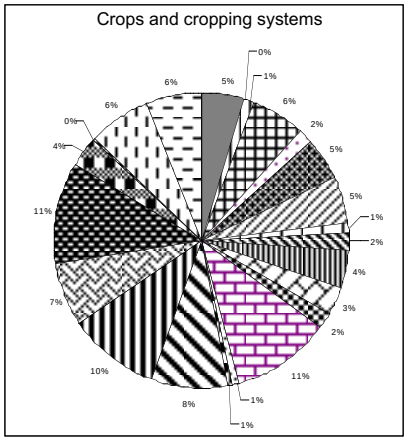


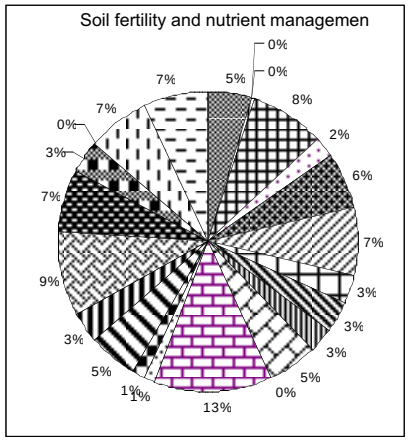
slightly with time and the work on rainwater management is as expected decreased with time. Integrated nutrient management almost remained constant and resource characterization work marginally increased.

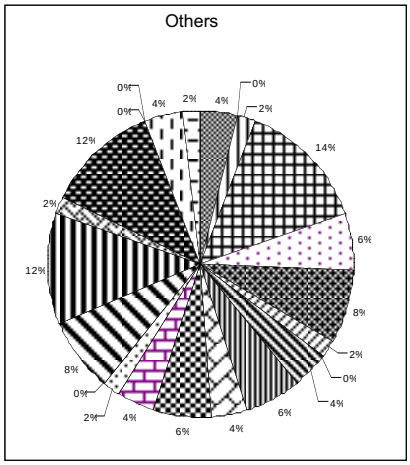
To the top four programmes major contributor was Indore. Thus cropping system programme, the resource management and utilization programmes almost shared equally in the publications.











The details on publications, recommendations and subject index follows.

2. Research Publications

A list of research articles published in various journals from the work carried out at the centers in the All India Co-ordinated Research Project is compiled. A few of the centers could not supply the full list of publications from the early period of the project formulation. The present listing has about 1002 numbers of annotated bibliographies published by various scientists from different disciplines from inception of the project - 1971 to 2002. The list includes some popular journals in case of socio-economics; otherwise the compilation is limited to refereed and reviewed articles published in professional journals. The center-wise information in chronological order follows:

Agra

1 Singh, S.P., Singh, K.B., Chauhan, R.S., Sharma, V.D. and Krishna, Mohan. (1975). Studies on split application of nitrogen to hybrid pearlmillet under rainfed conditions. Indian Journal of Agronomy. 20(3): 251-253.

2 Chauhan, S.P.S. and Singh, R.R. (1978). Studies on intercropping in arhar in Agra region. Journal of Agriculture Science Research. 20: 1-4.

3 Saha, A.K., Chauhan, C.P.S. and Yadav, D.S. (1980). Studies on soil-water behaviour and crop prodution under rainfed conditions. Journal of Indian Society of Soil Science. 28(3): 277-285.

4 Chauhan, S.P.S. and Chauhan, S.K. (1988). Intercropping of pigeonpea with short duration grain legumes in south-western Uttar Pradesh under dryland conditions. Journal of Agriculture Science Research. 30: 58-63.

5 Tripathi, N.C. and Chauhan, S.P.S. (1990). Response of pigeonpea (*Cajanus cajan* L.) varieties to varying plant population. Indian Journal of Agronomy. 35: 322-23.

6 Chauhan, S.P.S. and Singh, Sorban. (1991). Productivity of groundnut varieties in relation to plant density and phosphate fertilization under dryland conditions. Journal of Agriculture Science and Research. 33: 29-36.

7 Chauhan, S.P.S, and Singh, Sorban. (1991). Effect of variety, plant density and phosphate fertilization on root development in groundnut under dryland conditions. Journal of Agriculture Science and Research.33: 37-41.

8 Singh, R.D., Verma, B.S. and Rajput, O.P. (1992). Bajra + moong intercropping in rainfed area of Agra region. Fertilizer News. 37(ii): 43-45.

9 Singh, S.P., Chauhan, S.P.S., Chauhan, S.K. and Singh, P.K. (1992). Evaluation of drought frequency by rainfall data. Journal of Agriculture Science Research. 34: 1-5.

10 Singh, S.K. and Chauhan, S.P.S. (1992). Role of crop geometry in controlling weed menace in rainfed guar in semi-arid tract of Agra. Journal of Agriculture Science Research. 34: 15-19.

11 Chauhan, S.P.S. and Chauhan, S.K. (1993). Nitrogen requirement of Indian mustard in greengram-mustard sequence in south-western Uttar Pradesh. Indian Journal of Dryland Agriculture and Development. 8(2): 125-131.

12 Singh, Sharad kumar and Chauhan, S.P.S. (1993). Response of genotype and weed control to yield and harvest index of guar. Journal of Hendel. 10(2-4): 101-102.

13 Singh, S.P. and Chauhan, S.P.S. (1993). Phosphorus nutrition of chickpea + mustard in intercropping (4:1 row ratio) system under rainfed conditions. Indian Journal of Soil Conservation. 21: 29-31.

14 Singh, Pratap and Verma, R.S. (1995). Effect of tillage depth, sowing methods and N fertilization on soil properties and root development of pearlmillet. Indian Journal of Soil Conservation. 23(2): 135-139.

15 Singh, B.D. and Singh, B.P. (1998). Effect of weed management practices and phosphorus levels on weed infestation, nodulation and yield of chickpea + mustard intercropping system. Indian Journal of Weed Science. 30(3- 4): 124-128.

16 Singh, J.P. and Chauhan, S.P.S. (1999). Yield and quality of sunflower as influenced by moisture conservation practices and nitrogen levels in Agra region. Indian Journal of Soil Conservation. 27(3): 202-206

17 Singh, Y.P. and Agarwal, R.L. (1999). Effect of level of sulphur and phosphorus on yield and quality of blackgram. Indian Journal of Soil Conservation 27(3): 261-262.

18 Singh, B.P., Singh, Ranjeet and Omprakash (2000). Studies on row ratios and intercropping in gram (*Cicer arietum L*.) under dryland conditions. Journal of Agriculture Science Research. 36(1-2): 10-13.

19 Singh, B.P., Omprakash and Rajesh kumar. (2000). Intercropping of lentil (*Lens culinaris* Medik) with Indian mustard (*Brassica juncea* L.) and safflower (*Carthamus tinctorius* L.) under dryland conditions. Indian Journal of Soil Conservation.28 (2): 126-130.

20 Omprakash, Singh, B.P. and Kumar, Rajesh. (2000). Effect of lentil based prominent intercropping systems on soil water use and yields of crops in drylands in central Uttar Pradesh. Indian Journal of Pulses Research. 13(2): 29-33.

21 Sharma, R.S., Omprakash and Singh, B.P. (2000). Response of mothbean genotypes, phosphorous and row spacing under semi conditions. Annals of Plant and Soil Research. 2(2): 240-243.

22 Singh, B.P., Omprakash and Singh, R.V. (2000). Productivity and economics of lentil (*Lens culinaris*) varieties affected by row spacing and sulphur fertilization. Journal of Rural and Agriculture Research. 1(1): 1-3.

23 Kumar, Rajesh, Omprakash and Singh, B.P. (2001). Effect of lentil based intercropping on root growth, crop yield, protein and oil production under drylands. Indian Journal of Pulses Research. 14(1): 48-51.

24 Omprakash, Singh, B.P. and Singh, P.K. (2001). Effect of weed control measures and nitrogen fertilization on yield and yield attributes of sesame (*Sesamum indicum*) under rainfed conditions. Indian Journal of Agricultural Sciences. 71(9): 610-612.

25 Sharma, R.S., Omprakash and Singh, B.P. (2001). Effect of weed control measures on weed infestation, nodulation and yield in chickpea+mustard intercropping. Journal of Agricultural Science Research. 37(1-2): 4-8.

26 Avinash kumar and Singh, B.P. (2001). Studies on intercropping on chickpea (*Cicer arietinum*) – mustard (*Brassica juncea*) in relation to phosphate fertilization. Journal of Agriculture Science Research. 37(1-2): 12-14.

27 Singh, P.K., Omprakash and Singh, B.P. (2002). Nitrogen and weed management in sesame (*Sesame indicum*) in light textured soil under dryland conditions. Rural Agricultural Research. 2(1): 8-12.

Akola

1 Kayande, K. S. (1980). Climatic water balance and water availability calender for Vidarbha region, Maharashtra. Journal of Maharashtra Agriculture University (*Other details not available*).

2 Deshmukh, S. V., Jadhao P. N., Lande S. S., Jaybhaye C. P. and Patil V. N. (1998). Effect of planting ratio and pollination systems on seed set and yield in sunflower hybrid seed production of PDKVSH-27. Annals of Plant Physiology. 11(2): 206 - 207.

3 Dalvi, V. B., Bharad G. M., Nagdeve M. B. and Agrawal A. J. (1999). Vegetative system for rainwater management in clay soils. Indian Journal of Soil Conservation. December, 1999 (*Other details not available*).

Anantapur

1 Venkatanada Chary, G. Lakshminarayana, A. and Murthy, L.V. V. S. (1975). Straight bunds - A concept for low rainfall and shallow red soils of Rayalaseema. Financing Agriculture: 31-33.

2 Katama Reddy, B.C. (1980). The yield gaps and constraints for groundnut crop on Andhra Pradesh. Food Farming and Agriculture Journal. 13: 59-64.

3 Yogeswar Rao, A., Padmalatha, Y., Krishna Rao, K. (1990). Prediction of sorghum grain yield adopting soil water balance model. Annals of Arid Zone. 29: 81-85.

4 Yogeswar Rao, A. and Padmalatha, Y. (1990). Quantification of groundnut pod yield in arid region of Anantapur of water availability. Journal of Research. APAU. 18: 243-251.

5 Reddy, P. N., Hemanth Kumar, M. and Setty, B. V. K. (1990). Phenotypic stability of promising greengram cultivars. Journal of Research. APAU 18(1): 79-80

6 Yellamanda Reddy, T., Sreenivas, B. and Venkat Raju, K. (1992). Moisture conservation practices for stable yields of pearlmillet in arid region. Indian Journal of Dryland Agriculture Research and Development. 7(2): 70-72

7 Yogeswar Rao, A., Krishna Rao, K., Mallikarjuna Reddy, M. and Padmalatha. Y. (1992). Studies on the impact of different seed rates on yield and yield attributes of groundnut in drought prone areas of Anantapur district. The Andhra Agriculture Journal. 39: 22-26.

8 Katama Reddy, B. C., Padmalatha, Y. and Virupaksha Goud, D., (1992). A review on soil and moisture conservation on alfisols of scarce rainfall areas. Indian Journal of Dryland Agriculture Research and Development 7: 79-84

9 Katama Reddy, B. C., Padmalatha, Y. (1993). Effect of insitu soil and moisture conservation methods on run off and crop yields. Indian Journal of Soil Conservation. 21: 53-56

10 Yellamanda Reddy, T., Chandrasekhar Reddy, S. and Salu Reddy, N. (1993). Influence of improved dryland practices on growth and yield of dryland pigeonpea. Journal of Research. APAU. 19: 188-193.

11 Muniswamy, Y., Yellamanda Reddy, I., Venkat Raju, K. (1993) Survey on feasibility and adoption of primary tillage for groundnut in Anantapur district. Journal of Research. APAU. 21: 177-178

12 Yellamanda Reddy, T. and Padmalatha, Y. (1994). Weed management in groundnut, redgram-intercropping system under rainfed conditions in arid tropics. Indian Journal Agricultural Sciences. 64. 794-797.

13 Yellamanda Reddy, T. (1994). Management practices for amelioration of moisture stress in groundnut in arid tropics. Indian Journal of Agronomy. 39: 489 - 490.

14 Krishna Rao, K., Ramkrishna Reddy, M. G. and Padmalatha, Y. (1995). Rainfall analysis of Gudipadu Watershed area of Kurnool district, Andhra Pradesh, for crops planning. Indian Journal of Agricultural sciences. 65: 215-216.

15 Muniswamy.V., Lazarus.G.I., Yellamanda Reddy and Venkat Raju K. (1995). Effect of sand application on rainfed groundnut in arid tropics. Indian Journal of Agronomy. 40: 450-453.

16 Subbarami Reddy, D., Ramachandra Reddy, D. and Venkatanadhachary, G. (1997). A note on the effect of deep ploughing on basic infiltration rate of soils, roots growth and grain yield under rainfed agriculture at Anantapur. Annals of Arid-Zone. 16(1): 149-152.

17 Johnson, M., Subramanyam, K., Balaguravaiah, D., John Sudheer, M. and Vasundhara, S.(1999). An effective method of controlling late leaf spot disease in groundnut based on leaf wetness index. Annals of Plant Protection. 27(2): 172-177.

18 Krishna Murthy, S.K. (2000). Correlation between weather parameters on growthand yield at different phenophases. Annals of Arid zone. June (*Other details not available*).

19 Sulochanamma, B.N., Subramanyam, A., Balaguruvaiah, D. and Yellamanda Reddy, T. (2001). Influence of different management practices on the aflatoxin contamination in groundnut (*Arachis hypogea*). Indian Journal of Agricultural Sciences. 7 (11): 715-716.

20 Umamaheshwari, P., Padmalatha, Y. and Murali Rao, M. (2001). Evaluation of different sources of bio-fertilizers in association with inorganic and organic manures in groundnut. Agriculture Science Digest. 21 (4): 250-252.

Bangalore

1 Channappa, T.C. and Ashoka, H.G. (1972). Effect on bedding system on the yield of fingermillet as an inter terrace management practice in red soils under dryland conditions. Indian Journal of Soil Conservation. 20 (1 and 2): 1-8.

2 Goud, J.V. and Laxmi, P.V. (1972). Ragi varieties for drylands. Current Research. 1(1): 11-12.

3 Goud, J.V. and Laxmi, P.V. (1972). BH-8-18 groundnut variety is well suited for dryland conditions. Current Research. 1(4): 3.

4 Goud, J.V. and Laxmi, P.V. (1972). A promising variety of redgram for drylands. Current Research. 1(6): 44.

5 Hedge, B.R., Havanagi, G.V., and Satyanarayana, T. (1972). Response of ragi to phosphate application. Current Research. 1(2): 10-11.

6 Badanur, V.P. and Venkata Rao, B.V. (1972). P build up and its infuence on physical and chemical properties of Hebbal red soils. Mysore Journal of Agricultural Sciences. 6:105-112.

7 Badanur, V.P. and Venkata Rao, B.V., (1973). Studies on P build up and availability of micronutrients in red soils of Bangalore. Soil Science. 104:292-294

8 Badanur, V.P. and Venkata Rao, B.V., (1973). Studies on P saturation in red soil of Bangalore and its influence on crop yields. Current Research. 2:96-97.

9 Goud, J.V. and Laxmi, P.V. (1973). HK-289 A promising variety of setaria for drylands. Current Research. 2(4); 27.

10 Goud, J.V., Laxmi, P.V. and Narasimha reddy, M. K. (1973). C152- A promising cowpea variety for drylands. Current Research. 2(4): 13.

11 Badanur, V.P., Satyanarayana, T. and Havanagi, G.V. (1974). Influence of calcium and superphosphate on the yield of cowpea. Current Research.3: 20.

12 Goud, J.V. and Krishnashastry, K.S. (1974). Heterosis for vegetative and grain development in sorghum. Mysore Journal of Agricultural Sciences.44: 53-56.

13 Goud, J.V., Swamy Rao, T., Nair, K. M.D. and Rao, M.G. (1974). Variability in wheat-2, genetic and enviroment interaction, heredity and genetic advance. Genetic Agraria. 27: 440-446.

14 Goud, J.V., Swamy Rao, T., Nair, K.M.D. and Rao, M.G. (1974). Variability of wheat-1. Phenotypic and genotypic variability and coefficient of variation. Genetics Agraria.27: 433-439.

15 Rama krishna Rao, G., Badanur, V.P., Satyanarayana, T. and Havanagi, G.V. (1974). Soil moisture depletion pattern of different crops under rainfed conditions. Mysore Journal of Agricultural Sciences. 8: 554-560.

16 Satyanaryana, T., Badanur, V.P. and Havanagi, G.V. (1974). Influence in lime on ragi and groundnut and on exchangeable potassium. Mysore Journal of Agricultural Sciences. 8: 365-369.

17 Ramakrishna rao, G., Badanur, V.P. and Satyanarayana, T. and Havanagi, G.V. (1975). Influence of mulches and crop canopies on soil and air temperature under dryland conditions. Current Research. 4: 48-52.

18 Satyanaryana, T., Badanur, V. P. and Havanagi, (1975). Studies on the influence of calcium on ragi and groundnut crops. Journal of Indian Society of Soil Science. 23:60-66.

19 Badanur, V. P., Satyanarayana, T. and Havanagi, G. V., (1976). Influence of lime and phosphorus on the yield of blackgram and uptake of N and P. Current Research. 5: 20.

20 Badanur, V.P., Satyanarayana, T. and Havanagi, G. V., (1976). Effect of potash on groundnut, cowpea, maize and ragi. Indian Potash Journal. 1:22-26.

21 Hedge, B. R., Major, D. J., Wilson, D. B. and Krogman, K. K. (1976). Effects of row spacing and population density on grain sorghum production in southern Alberta. Canadian Journal of Plant Science. 56: 31-37.

22 Goud, J. V., Viraktamath, B. C. and Laxmi, P. V. (1977). Variability and correlation studies in blackgram (*Phaseolus mungo*). Mysore Journal of Agricultural Sciences. 11: 322-325.

23 Goud, J.V. and Laxmim P.V. (1977). Morphological and genetic variability in ragi (*Eleusine coracana*). Mysore Journal of Agricultural Sciences. 11: 438-443.

24 Hedge, B. R., Venugopal, N. and Firesen, G. H. (1977). Chemical weed control in rainfed peanuts. Weed Research. 17: 325-328.

25 Laxmi, P.V. and Goud, J.V. (1977). Variability in cowpea (*Vigna sinensis*). Mysore Journal of Agricultural Sciences. 11: 144-147.

26 Satyanaryana, T., Hedge, B. R., and Havanagi, G. V. (1977). A note on the estimation of 1/3 and 15 bars moisture percentage of black soils of northern Karnataka. Annals of Arid Zone. 16:147-148.

27 Satyanaryana, T., Varadan, K. M. and Havanagi, G. V. (1977). Effect of different sources of phosphate on ragi yield. Current Research. 6:104.

28 Hegde, B. R., Havanagi, G. V. and Munikrishna Reddy, N., (1978). Fertilizer need and water use efficiency of dryland ragi in a cowpea- ragi sequence. Mysore Journal of Agricultural Sciences. 12: 433-436.

29 Hedge, B. R., Havanagi, G. V., Satyanarayana, T., Nanjude Reddy, S. and Badanur, V. P. (1978). Consumptive use of water by dryland crops in Bangalore region. Indian Journal of Agronomy. 23: 87-97.

30 Munikrishna Reddy, N., Havanagi, G. V. and Hedge, B. R. (1978). Effect of soil moisture level and geometry of planning on the yield and water use of groundnut. Mysore Journal of Agricultural Sciences. 12: 50-55.

31 Munikrishna Reddy, N., Havanagi, G.V. and Hedge, B.R. (1978). Effect of soil moisture level and geometry of planning on the yield and water use of groundnut. Mysore Journal of Agricultural Sciences. 12: 50-55.

32 Satyanarayana, T., Badanur, V.P. and Havanagi, C.V. (1978). Response of maize to nitrogen, phosphorus and potassium on acid loam soils of Bangalore. Indian Journal of Agronomy. 23: 49-51. (*Other details not available*)

33 Satyanaryana, T. (1979). Nitrogen and phosphorus fertilization of ragi and red soils of Bangalore. Indian Journal of Agronomy. 23: 37-39. (*Other details not available*)

34 Ramana rao, B. V. and Satyanaryana, T. (1979). A climatological study on water availability to crops in different types of soils in Gulbarga region of Karnataka State. Journal of Indian Society of Soil Science. 27: 441-445

35 Satyanaryana, T. and Ranganatha, B. (1979). Soil crust and its effect on seedling emergence. Journal of Indian Society of Soil Science. 27: 369-374.

36 Hedge, B. R., Munikrishna Reddy, N. and Havanagi, G. V. (1980). Intercropping with ragi in karnataka. Indian Journal of Genetics and Plant breeding. 40A: 130-135.

37 Sudhakar, D., Hedge, B. R., Havanagi, G. V. and Avadhani, K. K. (1980). RS-114 a promising bunch of groundnut variety. Current Research.9: 200-201.

38 Hebbar Gopalkrishna, Havanagi, G. V. and Govardhan, H. L. (1981). Economic analysis of new farming practices in dryland cultivation. Current Research. 10: 167-170.

39 Hebbar Gopalakrishna, Havanagi, G. V., Govardhan, H. L. and Vishwanatha, A. P. (1981). Adoption of new technologies in dryland ragi production. Mysore Journal of Agricultural Sciences. 15: 1-5.

40 Narasimha murthy, S. N. and Hedge, B. R. (1981). Tillering in relation to inter row competition in ragi under rainfed conditions. Indian Journal of Agronomy. 26: 337-338.

41 Shambulingappa, K. G., Hedge, B. R. Sudhakar, D. and Avadhani, K. K. (1981). Culture- 1 and TVX-944-02E. Two new promising strains of cowpea. Current Research. 11: 137.

42 Hedge, B. R., Havanagi, G. V., Munikrishna Reddy, N., Venugopal, M., Viswanath, A. P. and Satyanarayana, T. (1982). Studies on the incorporation of maize residue on soil properties and yield of maize under rainfed conditions. Indian Journal of Agronomy. 27(3): 254-258.

43 Hebbar Gopalakrishna, Havanagi, G. V., Vishwanatha, A. P. and Govardhana, H. L. (1982). Adoption of cowpea-ragi double cropping technology in drylands. Current Research. 11: 42-43.

44 Hegde, B.R. and Jayarama Reddy, M. (1983). For late establishment, transplanting is better than drilling in ragi. Current Research. 12: 23.

45 Hegde, B. R. and Jayarama Reddy, M. (1984). Ragi can be sown mixed with diammonium phosphate. Indian Farming. 33(10): 9-11.

46 Shankaralingappa, B. C. and Hegde, B. R. (1989). Effect of date of sowing and plant population on pigeonpea. Indian Journal of Agronomy. 34(1): 99-100.

47 Krishnaegowda, K.T., Panduranga, Jayaram., Reddy, M. and Hedge, B.R. (1989). Grow arhar in May-June in Karnataka. Indian Farming. 39(1): 3

48 Gajanan, G.N., Srinivasa, S., Janakiraman, N. and Singlachar, M.A. (1990). Relative efficiency of rock phosphate against super phosphate in rainfed crops. Current Research. 19: 202-203.

49 Shashidhar, G.B., Joshi Shyamasunder and Hedge, B.R. (1990). Histology of cowpea (*Vigna unguiculata* L.) and horsegram (*Macrotyloma unifloruom* L. Verdec. J) nodules. Karnataka Journal of Agricultural Sciences. 3:47-52

50 Vishwanath shetty, V., Gajanan, G.N., Naidu, B.S. and Singlachar, M.A. (1990). Influence of levels calcium saturation on yield and oil content of sunflower. Current Research. 19:133-134.

51 Gajanan, G.N. (1991). Response of groundnut to different levels of calcium. Current Research. 20: 83-84.

52 Shankaralingappa, B.C. and Hedge, B.R. (1991). Intercropping studies in castor genotypes. Farming Systems. 7: 108-118.

53 Shivaramu, H.S., Krishnegowda, K.T., Hedge, B.R. and Venkataramu, M.N. (1991). Studies on intercropping of maize genotypes with pigeonpea, their harvesting time and fertility levels under dryland conditions. Mysore Journal of Agriculture Sciences. 25: 292-298.

54 Hegde, B.R. (1992). Strategies for increasing production in red soils. Indian Farming. 42(1): 19-25.

55 Shankaralingappa, B.C. and Hedge, B.R. (1992). Production potential of different dryland crops under late kharif conditions. Mysore Journal of Agriculture Sciences. 26: 248-253.

56 Shankaralingappa, B.C. and Hedge, B.R. (1992). Response of horsegram genotypes to row spacing. Current Research. 212:115-116.

57 Ashoka, H.G., Shashidhar, K.C. and Channappa, T.C., (1993). Water balance studies on graded border strips in alfisols under dryland conditions. Farming systems. (1-2): 26-35.

58 Gajanan, G.N. (1993). Fertililty status of tobacco growing soils of Shimoga area in Karnataka. Mysore Journal of Agriculture Sciences. 27: 141-145.

59 Hedge, B.R. and Pandurangaiah, K. (1993). Watershed management - prospects and problems. Fertilizer News. 38: 49-52.

60 Gowda, A. and Hedge, B.R. (1994). Efficiency of Nutrient Film Technique (NFT) for crop production. Current Research. 23: 27-28.

61 Krishnappa, A.M. and Hedge, B.R. (1994). Integrated watershed development: A holistic approach for resource conservation. Indian Farming. 44(9): 25-30.

62 Shashidhara, K.C., Ashoka, H.G., Ashoka Kumar, T.N. Panduranga and Hedge, B.R. (1994). A study on the feasibility of LDPE lining for dugout farm ponds. Indian Journal of Dryland Agricultural Research and Development. 8:91-100.

63 Shrinivasa Reddy, D.G., Krishnegowda, K.T., Panduranga and Hedge, B.R. (1994). Studies on production potentials of crops for fodder during late kharif under rainfed conditions. Mysore Journal of Agricultural Sciences. 28: 97-100.

64 Viswanatha Shetty, Y., Gajanan, G.N., Naidu, B.S. and Singlachar, M.A. (1995). Effect of levels of calcium saturation on seed yield, oil content, oil yield and uptake of nutrients by sunflower in acid soils. Mysore Journal of Agriculture Science 29: 22-29.

65 Gajanan, G.N. (1995). Effect of different levels of calcium saturation on seed yield, oil content, oil yield, and uptake of nutrients in arid soils. Mysore Journal of Agricultural Sciences. 29: 22-28

66 Siddaraju, S.P. and Channappa, T.C. (1995). Runoff and soil loss under different crop canopies and management in red soils of semi-arid tropics. Transaction of ASAE. 20: 33-40.

67 Nehru, S.D. and Manjunath, A. (1996). Genetic variability and path coefficient for some charactes in chilli. Progressive Horticulture. 8(3-4): 73-78.

68 Ujjinaiah, U.S., Gopinath, G. and Somashekar, K. (1996). Effect of genotypes and number of seeds per hill on plant population and seed yield of sunflower. Current Research. 88-90.

69 Murukannappa, Mukunda Rao, H.R., Arunkumar, Y.S., Krishnappa, A.M. and Chennappa, T.C. (1997). A contour V-ditch technique for mango. Indian Journal of Dryland Research and Development 12(1): 1-5.

70 Shankar, M.A., Devaiah, M.C., Ravi, K.N. and Puttaswamy, B., (1997-98). Effect of intercropping of minor millets on growth and yield of mulberry under rainfed condition. Journal of Farming System Research and Development 3 and 4 (1-2): 11-14.

71 Srirangappa, K.G. and Gajanan, G.N. (1997). Influence of different farming systems on the physical and biological properties of soils. Indian Agriculturist 41(a): 40.

72 Nagaraja, N., Majunath, A., and Gopalkrishna Rao. (1997). Genetic variability studies in horsegram (*Macrotolyma uniflorum* (Lam.) Verdec). Mysore Journal of Agricultural Sciences. 31: 326-330.

73 Nagaraja, M.S., Ramakrishnaparama, V.R., Srinivasa Murthy, C.A., Siddaramappa, R. and Gajanan, G.N., (1998). Influene of aldrin on important soil biochemical processes. Mysore Journal of Agriculture Science 32. (*Other details not available*).

74 Sriharsha, S.A., Shankar, M.A. and Dev, G., (1998) Response of mulberry to potassium nutrition and its economics. Crop Research Journal 16(2): 186-190.

75 Gajanan, G.N. and Deshpande, P.B. (1998). Characterization of industrial effluents. Current Research. 7:137-139.

76 Chowdegowda, M., Shankar, M.A. and Nanjundaswamy, M., (1999). Field evaluation of cultivator attachments to power tiller for mulberry cultivation. Mysore Journal of Agricultural Sciences 33: 342-347.

77 Shankar, M.A., Rangaswamy, B.T., Anita Peter, Manjula, S.K. and Rajegowda, (1999). Effect of feeding silkworm (*Bombyx mori L.*) with mulberry obtained by different sources of nitrogen on grainage parameters of NB4 D2. Crop Research 18(3): 373-377.

78 Prakash, B.G. and Shambulingappa, K.G. (1999). Estimation of chlorophyll and viable mutation under M2 generation in rice bean. Karnataka Journal of Agricultural Sciences. 12 (1-4): 58.

79 Rajegowda and Shankar, M.A. (1999). Effect of feeding silkworm (*Bombyx morri* L.) on leaf obtained by application of source of phosphorus and P solublizing microorganisms on larval growth and cocoon quality. Crop Research. 18(2): 301-306.

80 Nagaraja, N., Nehru, S.D. and Manjunath, A. (1999). Plant type for high yield in horse gram as evidenced by path coefficients and selection indices. Karnataka Journal of Agricultural Sciences. 12(1-4): 32-37.

81 Lohithaswa, H.C., Manjunatha, A. and Kulkarni, R.S. (2000). Combining ability analysis for fruit yield, capsaicin and other quantitative traits in chillies (*Capsicum annum* L.) over environments. Indian Journal of Genetics. 60(4): 511-518.

82 Nehru, S.D. and Manjunath,A., (2001). Genetic variability for yield and accessory characters in cowpea (*Vigna unguiculata* (L) Walp.). Indian Agriculture. 45(1and2); 99-101.

Bellary

1 Ranga Rao, V., Rama Mohan Rao, M.S., Hosmani, S.A.and Ramachandram, M. (1973). Effect of sowing dates on the incidence of shoot fly and varietal performance of *rabi* jowar in Mysore. Indian Journal of Agronomy. 18: 314-322.

2 Ramanath, B., Hayavadana Rao, D., Prabhajan Rao, S.B. and Balvir Verma (1973). Climatic factors influencing agriculture in the low rainfall tract of Bellary in Mysore state. Indian Journal of Meterology Geophysics.24 (2): 153-158.

3 Rama Mohan Rao, M.S., Chittaranjan, S. and Ranga rao, V. (1973). Effect of vertical mulch on moisture conservation and crop performance under dryland conditions in black cotton soils of Bellary. Journal of Indian Society of Soil Science. 21:237-239.

4 Prabhanjan Rao, S.B., Ramaiah, B., Sam, M.J. and Mittal, S.P. (1974). Cotton varietal trial under rainfed conditions in black soils of Bellary. Mysore Journal of Agricultural Sciences. 8:46-52.

5 Hayavadana Rao, D., Rama Mohan Rao, M.S. and Hussenappa, V. (1975). Effect of pressing the seeded rows on germination and crop stand in black soils. Current Research. 4:14-15.

6 Seshachalam, N., Rama Mohan Rao, M.S. and Ramachandram, M. (1975). Critical stages for moisture stress in cotton. Cotton Development.July 25-27.

7 Ranga Rao, V., Ramachandram, M. and Rama Mohan Rao, M.S. (1976). Plant density and geometry in relation to varietal differences and seasonal variations in rainfall for increasing and stabilizing production levels of *rabi* sorghum in dryland. Indian Journal of Agricultural Sciences. 46(12): 559-566.

8 Rama Mohan Rao, M.S. and Seshachalam, N. (1976). Improvement of intake rates in problem black soil. Mysore Journal of Agricultural Sciences. 10:52-58.

9 Nagaraja Rao, Y., Rama Mohan Rao, M.S. and Narayana Reddy, M. (1977). Effect of addition of sand to red soil on the seedling emergence of bajra. Indian Journal of Agricultural Research. 11(2): 116-118.

10 Rama Mohan Rao, M.S., Ranga Rao, V., Ramachandram, M. and Agnihotri, R.C. (1977). Effect of vertical mulch on moisture conservation and yield of sorghum in vertisols. Agricultural Water Management The Netherlands.1: 333-342.

11 Ranga Rao, V., Ramachandram, M. and Rama Mohan Rao, M.S. (1978). Some simple crop production practices for efficient exploitation of seasonal aberrations in rainfall in rainfed *rabi* belt of Bellary II. Mid seasonal correction in plant population as a life saving practice. Mysore Journal of Agricultural Sciences. (12): 425-433.

12 Rama Mohan Rao, M.S. and Seshachalam, N. (1978). Productivity problems of black soils of Bellary district in Karnataka. Mysore Journal of Agricultural Sciences. 12: 79-85

13 Ranga Rao, V., Ramachandram, M. (1979) Stability parameters for yield and its components in safflower. Mysore Journal of Agriculture Science. Vol. XIII No. 3

14 Chittaranjan, S., Rama Mohan Rao, M.S. (1981). Runoff harvesting and recycling on vertisols for increasing crop production. Indian Journal of Soil Conservation. 183-191.

15 Patnaik, U.S., Padmanabhan, M.V., Chittaranjan, L., Ramanatha, B., Hanumanthappa, B. and Subbayyan, R. (1982). Conservation ditching - a dual purpose terracing system for deep black soils. Indian Journal of Soil Conservation. 1(2and3): 73-77.

16 Rama Mohan Rao, M.S. and Murthy, N.S. (1982). Crop weather relationships under dryland farming in semi arid tropics. Indian Journal of Soil Conservation. 10(2and3): 46-53.

17 Ranga Rao, V., Rama Mohan Rao, M.S. and Selvarajan, S. (1983). Evaluation of improved farming practices in rainfed *rabi* sorghum for their feasibility on macro plots. The Andhra Agricultural Journal.30 (2): 71-76.

18 Rama Mohan Rao, M.S., Jayaram, N.S. and Agnihotri (1983). Cultivation of irrigated groundnut in vertisols and its impact on soil properties. Mysore Journal of Agricultural Sciences. 17: 235-238.

19 Selvarajan, S., Rama Mohan Rao, M.S. and Chittaranjan, S. (1984). Economic feasibility of farm pond for supplemental irrigation for *rabi* crops in semi arid deep black soils. Indian Journal of Soil Conservation. 12(1):

20 Rama Mohan Rao, M.S., Ramanath, B. and Murthy, N.S. (1985). Analysis of climatic factors for efficient crop planning and production in semi arid black soils. International Journal of Ecology and Environmental Sciences.11: 3-13.

21 Rama Mohan Rao, M.S., Ranga Rao, V. and Chittaranjan, S. (1985). Importance of moisture conservation in stabilizing yields from vertisols of low rainfall region. Indian Journal of Soil Conservation. 13 (2 & 3): 138.

22 Bhaskar Rao, P., Rama Mohan Rao, M.S. and Murthy, N.S. (1986). Studies on rainfall analysis at Bellary. Mysore Journal of Agricultural Sciences. 20:169-175.

23 Srivastva, A.K. and Rama Mohan Rao, M.S. (1988). Crop response under different agro-forestry practices in semi arid black soil region. Indian Journal of Soil Conservation. 16:1-10.

24 Srivastva, A.K., Rama Mohan Rao, M.S. and Ramanath, B. (1988). Technology for conservation agronomy of semi arid black soil (*rabi*) region. Indian Journal of Soil Conservation. 16(3): 14-21.

25 Rama Mohan Rao, M.S., Chittaranjan, S. and Chandrappa, M. (1988). Resource conservation through watershed management for improving productivity. Journal of Dryland Agricultural Research and Development. 3(2): 17-30.

26 Selvaraj, S., Rama Mohan Rao, M.S. and Chittaranjan, S. (1992). Impact and constraint analysis of watershed based resources conservation cum production management in alfisols of Karnataka. Agricultural Situation in India.799-806.

27 Rama Mohan Rao, M.S., Padmaiah, M., Raizada, A. and Ayyappa, B. (1993). Productive utilization of sandy river banks in the semi arid tropics. Indian Journal of Soil and Water Conservation. 21(2): 16-21.

28 Rama Mohan Rao, M.S., Adhikari, R.N., Chittaranjan, S., Chandrappa, M. and Padmaiah, M. (1993). Influence of conservation measures on water yield from catchments in the semi arid tract of south India. Journal of Hydrology. New Zealand 31(1): 23-28.

29 Rama Mohan Rao, M.S., Padmaiah, M., Reddy, K.K. and Patil, S.L. (1993). Sunflower as an oilseed crop of the semi-arid tropics of Andhra Pradesh. Farming Systems. 9:42-48.

30 Rama Mohan Rao, M.S., Agnihotrim R.C. and Patil, S.L. (1995). Response of *rabi* sorghum to levels and sources of phosphorus in the vertisols of semi arid tropics of Bellary. Indian Journal of Dryland Agricultural Research and Development. 9(2): 131-138.

31 Rama Mohan Rao, M.S., Srivastava, A.K. and Patil, S.L. (1995). Intercropping of *rabi* sorghum under rainfed conditions. Indian Journal of Dryland Agricultural Research and Development. 10(1): 48-55.

32 Rama Mohan Rao, M.S., Ranga Rao, V. and Chittaranjan, S. (1995). Importance of moisture conservation in stabilizing yields from vertisols of low rainfall region- soil conservation. Indian Journal of Soil Conservation. 23:131-138.

33 Rama Mohan Rao, M.S., Agnihotri, R.C. and Patil, S.L. (1995). Effect of sources and levels of nitrogen on *rabi* sorghum in vertisols of semi arid tropics of Bellary. Indian Journal of Agricultural Research. 29(3): 145-152.

34 Chittaranjan, S., Adhikari, R.N., Rama Mohan Rao, M.S., Husenappa,V. and Chandrappa, M. (1996). Water yield from small agricultural catchments in vertisols of the semi arid region of south India." Land Husbandry". International Journal of Soil and Water Conservation. 1:65-80

35 Patil, S.L., Math, S.K.N. and Rama Mohan Rao, M.S. (1999). Performance of *rabi* sorghum cultivars in the vertisols of semi arid tropics of India. Advances in Agricultural Research in India. 11: 43-47.

36 Patil, S.L., Rama Mohan Rao, M.S., Math, S.K.N. and Reddy, K.K. (1999). Moisture, plant population and nitrogen doses and their interactions on nutrient availability and production of *rabi* sorghum in the vertisols of deccan plateau. Advances in Agricultural Research in India. 12:17-26.

37 Patil, S.L. and Sheelavantar, M.N. (2000). Yield and yield components of *rabi* sorghum (*Sorghum bicolor*) as influenced by insitu moisture conservation practices and integrated nutrient management in the vertisols of semi arid tropics of India. Indian Journal of Agronomy. 45(1): 132-137.

38 Patil, S.L., Sheelavantar, M.N. and Surkod, V.S. (2000). Grain yield and economics of *rabi* sorghum as influenced by insitu moisture conservation practices and integrated nutrient management in semi arid vertisols. Indian Journal of Dryland Agriculture Research and Development. 15(2): 98-103.

39 Patil, S.L. and Sheelavantar, M.N. (2001). Effect insitu moisture conservation practices and integrated nutrient management and nutrient availability and grain yield of *rabi* sorghum (*Sorghum bicolor*) in the vertisols of semi arid tropics of south India. Indian Journal of Agricultural Sciences. 71(3); 229-233.

Bhilwara

1 Jangir, R.P., Sharma, S.L., Maliwal, P.L. and Dubey, M.M. (1989). Effect of nitrogen and phosphorus levels on growth and yield of Taramira (*Eruca- sativa* L.). Indian Journal of Agriculture Research 23(3): 117-120.

2 Kumpawat, B.S. and Rathore, S.S. (1989). Response of wheat varieties to sowing dates. Indian Journal of Agronomy 34(4): 447-448.

3 Nehra, M. R., Sodani, S. N. and Sastry, E. V. D. (1989). Correlation and path analysis in taramira (*Eruca sativa*) JSDT (4): 149-153.

4 Jain, P. M. (1990). Effect of phosphorus and potassium on yield of Opium poppy. Indian Journal of Agronomy 35(1): 238-239.

5 Jain, P. M. (1990). Effect of split application of nitrogen on Opium poppy. Indian Journal of Agronomy 35(1): 240-242.

6 Jain, P. M., Gaur, B. L. and Gupta, P. C. (1990). Response of Opium poppy varieties to nitrogen. Indian Journal of Agronomy 35(i): 243-245.

7 Kumpawat, B.S., Singh, R.P. and Rathore, S.S. (1990). Response of chickpea varieties to phosphorus. Indian Journal of Agronomy 35(4): 416-417.

8 Sodani, S. N. and Bhatnagar, S. K. (1990). Heterosis and inbreeding depression in sesame. Indian Journal of Genetics 50(1): 87-88.

9 Sodani, S. N., Sastry, E. V. D. and Nehra, M. R. (1990). Divergence analysis in taramira (*Eruca sativa*). Indian Journal of Genetics 50(1): 9-12.

10 Kumpawat, B.S., Singh, R.P. and Rathore, S.S. (1991). Effect of sowing date, variety and phosphorus level on yield of groundnut. Indian Journal of Agronomy 36-302-303.

11 Gupta, I.N., Maliwal, P.L. and Rathore, S.S. (1991). Effect of phenyl mercuric acetate spray on yield and economics of different winter crops under receding soil moisture condition. Indian Journal of Agricultural Sciences. 61(6): 429-430.

12 Gupta, I.N., Maliwal, P.L. and Rathore, S.S. (1992). Effect of fertilizer and phenyl mercuric acetate spray on wheat under tank bed conditions. Indian Journal of Agricultural Sciences 62(11): 767-768.

13 Maliwal, P.L., Gupta, I.N. and Rathore, S.S. (1992). Response of wheat to different fertility levels and antitranspirant spray under tank bed conditions. Indian Journal of Agronomy 37(3): 579-580.

14 Padmini, D. R., Porwal, B. L., Jain, P. M. and Patel, J. C. (1992). Effect of irrigation and nitrogen on yield and yield attributes of mustard (*Brassica juncea*). Indian Journal of Agronomy 37(3): 477-480.

15 Jain, P. M. and Solanki, N. S. (1993). Effect of preceeding crops on fertilizer requirement of Opium poppy (*Papaver somniferum*). Indian journal of Agronomy 38(1): 105, 106.

16 Jain, R. C. and Jain, P. M. (1993). Effect of preceeding kharif crops on yield and nutrient uptake by wheat under different levels on nitrogen. Indian Journal of Agronomy 38(4): 643-644.

17 Jat, M. L., Jaspal Singh and Acharya, M. S. (1993). Statistical approach for determination of aquifer parameters in large diameter well. Journal of Indian Water Resources Society 13(1-2): 82-86.

18 Maliwal, P.L., Gupta, I.N. and Rathore, S.S. (1993). Response of barley (*Hordeum vulgare*) to different fertility levels and PMA. under tank - bed conditions. Indian Journal of Agricultural Sciences 63(12). (*Other details not available*)

19 Rathore, S.S. and Gupta, I.N. (1993). Suitable row ratio for gram-safflower intercropping on conserved soil moisture. Indian Journal of Agricultural Sciences 63(11): 699-701.

20 Sodani, S. N., Rathore, S. S. and Nigam, S. P. (1993). Evaluation of maize (*Zea mays*) genotypes for intercropping with pigeonpea (*Cajanus cajan*). Indian Journal of Agricultural Sciences 63(4) 229-31.

21 Gupta, I.N. and Rathore, S.S. (1993). Intercropping studies in castor under dryland conditions in Rajasthan. Indian Journal of Agronomy. 38(2): 182-186.

22 Jain, P. M. and Rathore, S. S. (1994). Seed rate, fertility level and crops under delayed onset of monsoon in dryland areas. Indian Journal of Agricultural Sciences 64(5): 326-327.

23 Kumpawat, B.S. and Rathore, S.S. (1994). Effect of row orientation in rainy season crops. Indian Journal of Agricultural Sciences 64(7): 488-489.

24 Maliwal, P.L. and Rathore, S.S. (1994). Weed management in groundnut-sesame intercropping system. Indian Journal of Agricultural Sciences 64(6): 94.

25 Rathore, S.S. (1994). Fertilizer management in rainfed dryland agriculture. Indian Journal of Agricultural Sciences 64(6): 430.

26 Gupta, I.N., and Rathore, S.S. (1995). Effect of fertility levels on growth, yield and economics of pigeonpea (*Cajanus cajan*) + soyabean (*Glycine max*) intercropping system under rainfed condition in Rajasthan. Indian Journal of Agricultural Sciences 65(7): 512-514.

27 Jat, M. L., Acharya, M. S. and Jaspal Singh. (1995). Estimation of aquifer parameters by least-squares method under linear flow conditions in fractured rocks. Nordic Hydrology 26:III-124.

28 Jat, M.L., Acharya, M.S. and Singh, Jaspal. and Kothari, Anil. (1996). Determining aquifer parameters by method of averages under linear flow conditions in fractured rocks. Indian Journal of Power River Valley Development.16 (1-2): 19-23.

29 Laddha, K.C. and Totawat, K.L. (1997). Effect of deep tillage under rainfed agriculture on production of sorghum intercropped with greengram in western India. Soil Tillage Research. 43: 241-250.

30 Laddha, K.C. and Totawat, K.L. (1998). Interactive effect of tillage and phosphate fertilizers in conjunction with FYM to sorghum + greengram intercropping systems on physio-chemical properties of the soil. Annals of Arid Zone; 37 (1): 75-81.

31 Gupta, I. N., Maliwal, P.L. Kothari, Anil and Rathore, S.S. (1998). Effect of variety and Phenyl mercuric acetate on yield and economics of wheat (*Triticum aestivium)* under receding soil moisture condition. Indian Journal of Agronomy 43(1): 87-89.

32 Laddha, K.C. and Totawat, K.L. (1998). Interactive effect of tillage and phosphate fertilizers in conjunction with FYM to sorghum + greengram intercropping system on II. Performance of crops. Annals of Arid zone. 37(4): 373-276.

Bijapur

1 Badanur, V. P. (1976). Greengram followed by *rabi* jowar double cropping system is most remunerative under dryland conditions of Bagalkot.Current Research. 5:149-155.

2 Channabasaiah, M.S.K. and Belgaumi, M.I., (1977). Problems and prospects of rural poultry industry. Journal of Rural Economy. XXIII (7): 341-343.

3 Kachapur, M.D.and Badanur, V.P. (1977). Effect of salinity on the germination of niger varieties. Current Research. 6:167.

4 Satyanarayan, T., Varadan, K.M., Badanur, V.P. and Havanagi, C.V. (1977). Note on the effect of secondary and trace elements on sunflower. Indian Journal of Agriculture Research 11: 122-124.

5 Belgaumi, M.I. and Anasari, M.H., (1978). A simple easy device to find out land gradient. Current Research. 7. (Other details not available)

6 Jagainnavar, S.B., Prakash, B.G. and Shaila, H.M. (2002). Insect pests of mulberry under dryland sericulture at Bijapur. Insect Environment.7 (4): 183.

7 Satyanarayana, T. (1979). A climatological study on water availability to the crops in different types of soils in Gulbarga region of Karnataka. Journal of Indian Society of Soil Science.27 (4): (*Other details not available*)

8 Satyanarayana T. (1979). A study on water availability to the crops grown under rainfed conditions in different soils at Bijapur. Indian Journal of Meteorology, Geophysics and Hydrology. 27 (4): (*Other details not available*)

9 Satyanarayana T. (1979). Effect of clay and sesquioxide on soil crust and its effect on seedling emergence. Journal of Indian Society of Soil Science. 27 (3): (*Other details not available*)

10 Itnal, C.J., Pasandawar, S.D., Aswathappa, T., and Parwatikar, S.R. (1979). Supplemental irrigation through farm pond pays rich dividends. Current Research. 6: 145-150.

11 Itnal, C.J., Batagurkim S.B., Hosmani, S.A. and Sajjan, G.C. (1980). Vertical mulching helps to increase sorghum fields. Current Research.9: 130-132.

12 Itnal, C.J., Prabhudev, T.V. and Srinivas Achar, N. (1980). Mixed cropping with *rabi* sorghum. Current Research. 9: 50-52.

13 Raman, K.V., Itnal, C.J., Desai, G.S. and Sajjan, G.C. (1980). Genotype variability and correlation studies on some quantative characters in safflower. Current Research. 9: 15-17.

14 Belgaumi, M.I., and Ramaiah, S. (1981). Effect of circular opening of tile on the efficiency of tile drainage system. Journal of Agriculture Engineer. XVII: 9-12

15 Itnal, C.J., Desai, G.S., Sajjan, G.C. and Parvatikar, S.R. (1981). Effect of supplemental nitrogen on plant characters, grain and fodder yield of *rabi* sorghum under dryland conditions. Current Research. 9:14-25.

16 Sajjan, G.C., Itnal, C.J., Patil, S.S. and Parvatikar, S.R. (1981). Growth and yield contributing characters of *rabi* sorghum are influenced by furadon. Current Research 10: 50-51.

17 Venkateshappa, K.M., Seetharam, A., Patil, M.S. and Nayakar, N.Y. (1981). Stability of yield and yield components in foxtail millet, Indian Journal of Agriculture Sciences. 54(4): 256-260.

18 Guruswamy, T. and Belagaumi, M.I. (1983). Evaluation of land levelling implements under dry land conditions. A case study Indian Journal of Soil Conservation. 11: (2 and 3). *(Other details not available)*

19 Guruswamy, T., Belgaumi, M.I. and Patil, V.D. (1983). Low cost land layout implement for insitu moisture conservation in deep black soils of Karnataka. Indian Journal of Soil Conservation. 13:1-3.

20 Balgaumi, M.I. Basavaraja, H., Radder, G.D. and Itnal, C.J. (1984). Economic evaluation of soil conservation structures in the vertisols of northern dry zone of Karnataka. Indian Journal of Soil Conservation 22: 78-82.

21 Nayakar, N.Y., Swamy Rao, T. and Kachapur, M.D. (1984). N.71-A. A new improved variety of niger. Current Research. 13: 7-9.

22 Guruswamy, T. Begaumi, M.I. (1985). Development of land into contour border strips using bullock power. A case study – Indian Farming 34: 10.

23 Mudakavi, D.H., Itnal, C.J., Guruswamy, T. and Belgaumi, M.I. (1986). Effect of alternate year ploughing in shallow soils on moisture conservation under dryland farming. Indian Journal Soil Conservation. 14: (*Other details not available*).

24 Mudkavi, B.M., Guruswamy, T. and Itnal, C.J. (1986). Energy requirement for production of rainfed sorghum in black soils- an analysis. Agriculture Engineer Today. 10 (2 and 3): (*Other details not available*).

25 Nayakar, N.Y., Gowda, B.T.S. and Goud, J.V. (1986). Linex tester analysis for seed density, 100 grain weight, harvest index and its components in *rabi* sorghum (*Sorghum bicolor* (L). Moencha) . Indian Journal of Agricultural Research. (*Ohers details are not availabe*)

26 Badanur, V.P. and Deshpande, P.B. (1987). Soil moisture and nutrient uptake in *rabi* sorghum grown on vertisol. Journal of Indian Society of Soil Science.35: 404-411.

27 Badanur, V.P. and Poleshi, C.M. (1987). Influence of nutrients and moisture on the water use efficiency of *rabi* sorghum in vertisol. Indian Journal of Soil Conservation. 15: 11-14.

28 Nayakar, N.Y., Gowda, B.T.S. and Goud, J.V. (1987). Combining ability analysis for panicle components in *rabi* sorghum (*Sorghum bicolor* (L) Moencha). Mysore Journal of Agricultural Sciences. (*Other details not available*)

29 Biradar, B.M., Surakod, V.S. and Radder, G.D., (1988). Evaluation of cropping systems for zing conservation structure- Mysore Journal of Agricultural Sciences: (*Other details not available).*

30 Balgaumi, M.I. Gopal krishna Hebbar, B. and Patil, V.S. (1989). Economic analysis of farm pond technology in black soils of dryland areas. Mysore Journal of Agricultural Sciences 23: 258-265.

31 Halemani, H.L. Sajjan, G.C., Surakhod, V.S., and Radder, G.D. (1989). Response of horsegram genotypes to nitrogen and phosphorus levels. Karnataka Journal of Agricultural Sciences 2(4): 245-249.

32 Halemani, H.L., Halliker, S.S., Surkhod, V.S., Sajjan, G.C.and Radder, G.D. (1989). Effect of frequency and intensity of leaf cutting on the fiber yield and growth components of Agave genotypes. Farming Systems. 5(1and2): 12-17.

33 Radder, G.D., Surkhod, V.S., Biradar, B.M. and Patil, V.S. (1989). Border method of planting for stabilizing the yield of rainfed *rabi* crops. Farming systems.5 (1and2): 33-40.

34 Badanur, V.P., Poleshi, C.M. and Balachandra Naik (1990). Effect of organic matter on crop yield, physical and chemical properties of vertisol. Journal of Indian Society of Soil Science, 38: 426-429.

35 Halemani, H.L. Sajajan, G.C., Surakod, V.S., Yandagoudar, B.A., Mohankumar, H.D. and Radder, G.D. (1990). Evaluation of pigeonpea genotypes for intercropping with hybrid bajra. Karnataka Journal of Agricultural Sciences 3 (1 and 2): 20-25.

36 Guruswamy, T. and Belgaumi, M.I. (1991). Evaluation of sweep and blade adhoc-A case study. Current Research 20: 114-115.

37 Itnal, C.J., Belgaumi, M.I. and Radder, G.D. (1991). Concepts and management strategies for water conservation in dryland farming Bhagiratha. 38(2): 51-54.

38 Radder, G.D., Itnal, C.J., Surakod, V.S. and Biradar, B.M. (1991). Compartment bunding - an effective in situ moisture conservation practice in medium deep black soil. Indian Journal of Soil Conservation 19 (1 and 2): 1-5

39 Badanur, V.P. and Tolanur, S.I. (1992). Effect of grasses, legumes and cropping system on soil productivity of marginal eroded black soil. Indian Journal of Soil Conservation 20(3): 77-81.

40 Mallikarjunappa Gowda, D.S., Maurya, N.L., Belgaumi, M.I., Chidananda, P., Mansur and Kubsad, V.S. (1992). Impact of water harvesting structures (nala bund) on ground water recharge. Indian Journal Soil Conservation. 20(3): 65-71.

41 Radder, G.D., Surakhod, V.S., Biradar, B.M and Patil, V.S. (1992). Border method of planting for stabilizing the yield of rainfed *rabi* crops. Journal of Recent Advances in Dryland Agriculture.177-180.

42 Bellakki, M. A. and Badanur, V.P. (1993). Influence of organic residue recyling on crop yield and nutrient uptake by *rabi* sorghum. Karnataka Journal of Agricultural Sciences 6: 339-344

43 Itnal, C.J., Halemani, H.L., Radder, G.D., Surakhod, V.S. and Sajjan, G.C. (1993). Response of sesamum genotypes to application of fertilizers in drylands. Journal of Maharashtra Agricultural University 18(3): 374-375.

44 Itnal, C.J. Radder, G.D., Halemani, H.L., Surakhod, V.S. and Sajjan, G.C. (1993). Response of cotton genotypes to time of sowing in drylands. Karnataka Journal of Agriculture Sciences 6(2): 117-120.

45 Badanur, V.P. and Poleshi, C.M. (1994). Effect of cheap sources of phosphorus on yield and growth of forage subabul. Indian Journal of Dryland Agriculture Research and Develpoment. (*Other details not available*)

46 Bellakki, M. A. and Badanur, V.P. (1994). Effect of crop residue incorporation on soil physical and chemical properties of a vertisol and yield of sorghum. Journal of Indian Society of Soil Science 47: 533-535.

47 Gowda, D.S.M., Maurya, N.L., Belgaumi, M.I., Mansur, C.P. and Kubsad, V.S. (1994). Effect of nala bunds on run-off and soil loss under shallow black soil areas. Journal of Maharashtra Agricultural University 19(3): 489-490

48 Itnal, C.J., Belgaumi, M.I. Badanur, V.P., Surakhod, V.S. and Sajjan, G.C., (1994). Strategies for increasing the productivity of drylands in northern dry Zone of Karnataka. Indian Journal of Dryland Agriculture Research and Development 9: 146-158.

49 Patil, Y.M., Belgaumi, M.I., Maurya, N.L., Kubsad, V.S., Mansur, C.P. and Patil, S.L. (1995). Economic evaluation of different barriers on growth and yield of *rabi* sorghum. Indian Journal of Soil Conservation 23(1): 86-87

50 Tolnur, S.I. and Badanur, V.P. (1995). Characterization of Doni river water of Bijapur, Karnataka Journal of Agriculture Sciences. 84: 420-422.

51 Badanur, V.P. and Malabasari, T.A. (1996). Effect of recycling of organic residues on soil properties and yield of sorghum in vertisol. Indian Journal of Soil Conservation 23: 236-238.

52 Contractor, R.M. and Badanur, V.P. (1996). Effect of forest vegetation on properties of vertisol. Journal of Indian Society of Soil Science 44: 510-511

53 Bellakki, MA, Badanpur VP (1997). Long term effect of integrated nutrient management on properties of vertisols under dryland agriculture. Journal of Indian Society of Soil Science. 45(3): 85-89

54 Bellakki, M.A., Badanur, V.P. and Setty, R.A. (1998). Effect of long term integrated nutrient management on some important properties of a vertisols. Journal of Indian Society of Soil Science. 46(2): 176 180.

55 Venkatesh, H., (1998). Rainfall climatology of Bijapur: an apprisal Karnataka. Journal of Agricultural Sciences 11(2): 492-494.

56 Venkatesh, H., Prakash, B.G. and Surakhod, V.S. (1999). Agroclimatology for optimization of sowing time of sunflower. Journal of Agrometrology, 1(1): 27-31.

57 Ravi Kumar, M.R., Prakash, B.G. and Somsekhara, Y.M. (2001). Evaluation of fungicides against mulberry wilt (*Fusarium S*p.) in vitro and in vivo conditions. Crop Research, 22(2): 248-250.

Dantiwada

1 Patel, R.R., Naliwal, G.I., Patel J.R. and Shah, C.B. (1979). Studies on the efficiency of bajra (*Pennisetum typhojdes*) and guar (*Cyamopsis tetragonaloba*) varieties under dryland condition. Gujarat Agricultural University Research Journal. 5(1). (*Other details not available*)

2 Maliwal, G.L., Patel, R.R. Sanani, V.V. and Sasani, G.V. (1980). Studies on the relative efficiency of castor and cotton varieties under rainfed condition. Gujarat Agricultural University Research Journal. 6. (*Other details not available*)

3 Shah, C.B., Patel, P.C. and Patel, P.T. (1980). Effect of levels and methods of nitrogen application on rainfed pearlmillet (*Pennisetum typhoides*). Gujarat Agricultural University Research Journal. 6. (*Other details not available*)

4 Shah C.B., Patel, R.R., Maliwal, G.L., Sonani, V.V. and Patel, J.R. (1982). Effect of nitrogen and spacing on yield and quality of 'Hybrid-4' cotton under rainfed condition. Gujarat Agricultural University Research Journal, 8(2): 91-96

5 Patel, R.R., Maliwal, G.L., Patel, J.R. and Shah, C.B. (1982). Studies on relative efficiency of bajra (*Pennisetum typhoides*) and guar (*Cyamopsis tetragonoloba*) varieties under dryland condition. Gujarat Agricultural University Research Journal, 8(1): 5-12.

6 Sahu, D.D. and Patel, R.R. (1984). Probability study of rainfall for Banaskantha district of north Gujarat region. Gujarat Agricultural University Research Journal. 10(2): 27-33

7 Vyas, Pandey and Patel, R.R. (1985). Agroclimatic study for dry farming of Banaskantha. Gujarat Agricultural University Research Journal. 11(1): 30-34.

8 Patil, R.G. and Sarkar, M.C. (1991). Influence of urea and green manure on uptake of labelled N and total N by rice growth on soil previously amended with wheat straw. Journal of Nuclear Agriculture Biology. 20(3): 190-198.

9 Patel, M.S., Patil, R.G., Zalawadia, N.M. and Sutaria, G.S. (1992). Effect of P, moisture and organic matter on availability and its fractions in calcareous clay soil at different incubation period. Journal of Indian Society of Soil Science. 40(4): 705-710.

10 Patel, B.T., Sakhela, R.R.,Kalyanasundaram, N.K., Patil, R.G. and Patel, G.A. (1993). Chemical composition of different ber varieties. Annals of Arid zone. 32(2): 109-111.

11 Patil, R.G.and Sarkar, M.C. (1993) Mineralization and immobilization of N in soil mixed with wheat straw. Journal of Indian Society of Soil Science. 41(1) 33-37.

12 Patil, R.G. and Sarkar, M.C. (1993). Forms of soil N as affected by labelled area and *Sesbania* to previously wheat straw amended paddy soil. Journal of Nuclear Agricultural Biology. 22: 170-177.

13 Patel, K.M., Sadrasania, R.M., Patel, B.T. and Patil, R.G. (1994). Distribution and status of DTPA extractable micronutrients cations in some soils of north and north - west agroclimatic zones of Gujarat. Gujarat Agricultural University Research Journal. 19(2): 26-32.

14 Patel, I.S., Patel, M.V., Patel, H.D. and Patel, R.H. (1996). Weed management in biode psyllium (*Plantago ovata*) under north Gujarat conditions. Indian Journal of Agronomy. 41(3) 476-479.

Dehradun

1 Gurmel Singh, Bhushan, L.S., Koranne, K.D., Friesen, G. (1980) Times of applying herbicides for control of weeds in maize in Doon valley. Indian Journal of Agronomy. 25 (1). *(Other details not available)*

2 Singh, Gurmel. and Mohan, S.C. (1983). Studies on production potential of some promising crops sequence and their effect on soil characteristics under rainfed conditions. Indian Journal of Soil Conservation, 2(2-3): 16-20.

Faizabad

1 Singh, R.A., Singh, B., Singh, R.P., Tripathi, H.P. and Kumar, V. (1994). Response of linseed (*Linum usitatissium* L.) varieties to nitrogen under dryland conditions of eastern U.P. Haryana Journal of Agronomy 10(1): 63-65.

2 Singh, B. and Kumar, V. (1996). Effect of phosphorus and sulphur application on lentil (*Lens cullinaris*) under rainfed conditions. Indian Journal of Agronomy. 41(3): 420-433.

3 Singh, B. and Kumar, V. (1996). Response of Indian mustard (*Brassica juncea*) to nitrogen and sulphur application under rainfed conditions. Indian Journal of Agronomy 41(2): 286-289.

4 Singh, B. and Singh, R.P. (1996). Productivity of various crops as influenced by crop sequences under normal and delayed sown conditions in dryland of eastern Uttar Pradesh. Indian Journal for Dryland Agriculture Research and Development. 11(1): 33-35.

5 Singh, B. and Vinod Kumar (1996). Effect of phosphorus and sulphur application on lentil (*Lens culinaris*) under rainfed condition. Indian Journal of Agronomy. 41(3): 420-433.

6 Singh, B., Singh, R.A. and Singh, A.K. (1996). Intercropping compatibility of different crops with pigeonpea (*Cajanus cajan*) grown under dryland conditions of eastern Uttar Pradesh. Indian Journal of Dryland Agriculture Research and Development 11(2): 117-120.

7 Singh, B. Singh, and Ram Pratap (1996). Influence of crop sequences under normal and delayed sown conditions on productivity of crops. Indian Journal of Dryland Agricultural Research and Development. 11(1): 36-40.

8 Singh, S.K. and Singh, B. (1997). Studies on fertilizer management in pigeonpea based intercropping system under dryland conditions. New Agriculturist 8(2): 58-61.

9 Singh, A.K., Singh, B., Shivakant and Vinod Kumar (1998). Effect of organic manure and fertilizer doses on performance of kharif sorghum of eastern Uttar Pradesh. Indian Journal for Dryland Agricultural Research and Development. 13(1): 19-20.

10 Singh, A.K., Singh, B., Singh, R.A. and Singh, R.P. (1998). Identification of highly economic crop and variety for dryland areas of eastern Uttar Pradesh. Indian Journal for Dryland Agricultural Research and Development. 13. (*Other details not available*)

11 Singh, S.K., Singh, B., Singh, G. and Singh, A.K. (1998). Studies on fertilizer management in pigeonpea based intercropping under dryland conditions. Indian Journal for dryland agricultural research and development. 13(1): 1-3.

12 Singh, S.K. and Singh, B. (1999). Studies on fertilizer management in pigeonpea based intercropping systems under dryland condition. New Agriculturist, 10 (1and2): 21-24.

13 Rai, Mahendra. Singh, H.C and Prasad, Kanti. (1999). Effect of different sowing Techniques on yield of wheat in rainfed Sarjoo Diara. Annals of Plant and Soil Research. 1. (*Other details not available*)

14 Singh, H.C., and Kanti, Prasad. (2000). Effect of spot sowing compaction on seedling emergence of gram, a laboratory study. Annals of Plant and Soil Research 2(1): 153-155.

15 Singh, B. and Singh, A.K. (2001). Influence of row spacing and nitrogen levels on niger (*Guizotia abyssinica*) under rainfed condition. Indian Journal of Dryland Agricultural Research and Development. 16(1): 69-72

16 Surendra kumar, Singh, B. and Rajput, A.L. (2001). Response of Indian mustard (*Brassica juncea*) to source and level of sulphur. Indian Journal of Agronomy. 46(3): 528-532.

17 Mishra, B.N., Singh, B. and Rajput, A.L. (2001). Yield quality and economics as influenced by winter maize (*Zea mays*) based intercropping system in eastern Uttar pradesh. Indian Journal of Agronomy. 46(3): 425-431.

18 Ram, S. N. and Singh, B. (2001). Productivity and economics of forage sorghum (*Sorghum bicolor*) in association with legumes under different harvesting times and nitrogen levels. Indian Journal of Agronomy. 46(4): 611-615.

19 Singh, B. and Singh, A.K. (2002). Production potential and economics of barley (*Hordeum vulgare*) as affected by varying seed rates and methods of sowing under rainfed conditions. Indian Journal of Dryland Agricultural Research and Development. 17(2): 120-123.

20 Singh, B. and Singh, A.K. (2002). Varietal behaviour of Indian mustard (*Brassica juncea*) to varying sources and levels of sulphur. Indian Journal of Dryland Agricultural Research and Development. 17(2): 140-143.

Hisar

1 Mehrotra, Naresh and Shukla, G.P. (1973). Safflower as *rabi* fodder for rainfed areas. Haryana Agricultural University Journal of Research. 3(3): 195-196.

2 Oswal, M.C. (1973). Pitcher farming of vegetables under dryland "A new dimension in water harvesting". Haryana Agricultural University Journal of Research 5(4): 351-353.

3 Mehrotra, Naresh, (1975). Promise of castorbean in low rainfall years at Hisar. Journal of Research Hisar Agricultural University. 5(2): 158-163.

4 Oswal, M.C. (1976). Response of different winter crops to limited water supply. Indian Journal of Agriculture Science 43(12): 603-604.

5 Paroda, R.S. and Mehrotra, Naresh. (1976). An investigation of genotype environment interactions for green fodder yield in clusterbean (*Cyamopsis tetragonoloba*, L. Taub.) Genetics in Agriculture 30: 191-200.

6 Oswal, M.C. (1977). Effect of different presoaking tillage practice for bajra on moisture conservation and water budgeting for bajra under dryland agriculture. Current Agriculture 1(1-12): 35-40.

7 Oswal, M.C. and Bakshi, R.K. (1977). Note on effect of different combination of polyvinyl alcohol and farmyard manures on soil crust strength. Current Agriculture 1(4): 67-68.

8 Naresh Mehrotra, Malik, D.S. and Choudhary, B.D. (1979). Studies in stability parameters in cluster bean (*Cyamopsis tetragonoloba,* L. Taub.) for seed yield in rainfed conditions. Haryana Agricultural University Journal of Research 10(1): 77-80.

9 Malik, D.S., Oswal, M.C. and Bakshi, R.K. (1979). Interaction of profile soil moisture and row spacing on the performance of chickpea on drylands. Indian Journal of Tropical Agriculture 1(1): 51-58.

10 Malik, D.S., Oswal, M.C., Bakshi, R.K. (1979). Interaction between profile soil moisture and row spacing of bengalgram on grain yield. Indian Journal of Agriculture Sciences. 50.

11 Dhankar, B.S., Mehrotra, Naresh and Chowdhary, B.D. (1980). Genetic divergence is normal and ratoon crops of brinjal (*Solanum* L.) Indian Journal of Agriculture Science. 50 (2).

12 Malik, D.S. (1980). Cultural and chemical weed control in pearlmillet (*Pennisetum americanum* (L) K Schum). Haryana Agricultural University Journal of Research. 10 (1). (*Other details not available*)

13 Malik, D.S. (1980). Studies in stability of cluster beans (*Cyamopsis tetragonoloba*) Journal for seed yield in rainfall conditions. Haryana Agricultural University Journal of Research. 10 (1). (*Other details not available*)

14 Malik, D.S. (1980). Interaction of profile soil moisture and row spacing on the performance of chickpea on drylands. Indian Journal Agriculture Science. 50 (1). (*Other details not available*)

15 Oswal, M.C. and Bakshi, R.K. (1981). A simple device for measuring seedling emergence force. Journal of Indian Society of Soil Science 29: 547-548.

16 Malik, D.S., Singh Surinder, Karwasra, R.S., Bishnoi, L.K. (1983). Studies on relative efficiency of important crops for seed yield in rainfed conditions. International Journal of Tropical Agriculture, 1: 51-58.

17 Singh Surinder, Mehrotra Naresh and Karwasra, R.S. (1983). Water use criteria for selecting rainfed crops and their varieties. Tropical plant Science Research 1: 71-74

18 Joon, R.K., Oswal, M.C. and Hooda, I.S. (1984). Effect of soil moisture and soil cover over seeds on germination of mustard. Indian Journal of Agronomy 29: 392-393.

19 Singh, R., Oswal, M.C. and Nath, J. (1985). Prediction of falling rate of evaporation from bare soils. Journal of Indian Society of Soil Science 33: 1-4.

20 Singh Surinder, Singh Ran, Malik, D.S. and Karwasra, R.S. (1985). Response of pearlmillet hybrids to levels of nitrogen under rainfed conditions of Haryana. International Journal of Tropical Agronomy 3(3): 198-201.

21 Malik, R.K., Narda, N.K. and Murty, V.V.N. (1986). A critical appraisal of macroscopic scale models of soil moisture dynamics under cropped conditions for soil moisture estimation. International Journal of Tropical Agriculture 4(4): 300-309.

22 Panwar, K.S., Malik, R.K., Vijay Kumar and Karwasra, R.S. (1989). Management of shallow rainfed aridisol with calcic horizon for improving water use efficiency of chickpea and taramira. Indian Journal of Dryland Agricultural Research and Development 4(1): 68

23 Verma, H.N. and Sarma, P.B.S. (1989). Critical dry spell and irrigation to rainfed crops. Journal Indian Water Resources Society. 9(4): 12-16.

24 Dahiya, I.S., Hooda, P.S. and Dashora, L.N. (1989). Use of geostatistical techniques for the evaluation of temproral variation in ground water table depth data. International Journal of Tropical Agriculture.7: 159-172.

25 Dashorak, G.K., Maliwal, P.L. and Dashora, L.N. (1989). Study on the effect of different herbicides and nitrogen level on weed control and seed yield of mustard (*Brassica juncea* L). Indian Journal of Agriculture sciences. 59(11): 742-4

26 Porwal, B. L., Mathur, Y.K., Goswami, S.P. and Maliwal, P. L. (1989). Biochemical changes associated with chemical crop protection in mustard cultivars. Indian Journal of Agronomy. 34(3): 293-96.

27 Shekhawat, P.S. and Maliwal, P.L. (1989). Evaluation of some new herbicide for weed control in potato (*Solanum tuburasum* L) Indian Journal of Agriculture Sciences. (11): 739-41.

28 Singh, R., Khatkar, O.P., Laura, R.D. and Kuhad, M.S. (1989). Studies on P32 movement in soil columns as affected by sources, method of P application, soil type, $CaCO_3$, FYM and $MgSO_4$. International Journal of Tropical Agriculture. 7: 134-141.

29 Singh, R., Sangwan, R.S. and Chaudary, R.K. (1989). Combining ability and gene effects for harvest index in durum wheat. Haryana Agricultural University Journal of Research. (*Other details not available*)

30 Verma, H.N. and Sarma, P.B.S. (1990). Hydrologic design of runoff storage tank in rainfed areas, Hydrology. Journal of IAH, 13(1): 45-54.

31 Verma, H.N. and Sarma, P.B.S. (1990). Criteria for identifying effective monsoon for Sowing in rainfed agriculture Journal of Irrigation and Power. April. 177-184.

32 Dahiya, I.S, Dahiya, D.J., Shanwal, A.V., Laura, R.D. and Agarwal, R.P. (1990). Geostatistical analysis of temporal variaton in water content of sand dune soils. International Journal of Tropical Agriculture. 7: 54-65

33 Singh, V., Singh Harbir, Lajpat and Panwar, K.S. (1990). Establishing crop yield weather parameters relationship at Hisar. Haryana Agricultural University Journal of Research 20(2): 139-144.

34 Malik, R.K. and Sangwan, P.S. (1991). Water budgeting of legumes and pearlmillet during kharif. Journal of Applied Hydrology 4(3 and 4): 27-31.

35 Karwasra, R.S. and Faroda, A.S. (1979). Response of gram varieties to seed rates and row spacings. Hisar Agriculture University Journal of Research 9(1): 55-56.

36 Kumar, S. and Sangwan, R.S. (1994). Genetic variability, heritability and genetic advances in *Brassica* spp. Under dryland conditions. Agriculture Science Digest 14(3): 172-176.

37 Oswal, M.C. (1994). Water conservation and dryland crop production in arid and semi-arid regions. Annals of Arid Zone 32: 95-104.

38 Ramesh Kumar, Katyal, S.K. and Midha, L.K. (1995). Relative performance of herbicides for control of weeds in field peas. Haryana Journal of Agronmy 10(1): 96-98.

39 Yadava, D.K., Sangwan, R.S. and Dahiya, B.S. (1995). Studies on the planting ratios of A and R lines for hybrid seed production in sunflower. Indian Journal of Tropical Agriculture 13(1-4): 129-135.

40 Oswal, M.C. (1995). Water production function of dryland crops on aridisols. Journal of Indian Society of Soil Science. 43: 320-322.

41 Pahuja, S.K., Sangwan, R.S., Arora, R.N. and Jindal, V. (1996). Gene effects for oil content in Indian mustard. Haryana Agricultural University Journal for Research 26: 163-167.

42 Sangwan, R.S., Singh, R.K., Hooda, B.K and Panwar, K.S. (1996). Insitu soil moisture conservation for optimizing production of fruit crops in sub-mountaneous Kandi Tract in Haryana. Annals of Biology 12: 215-220.

43 Shanwal, A.V., Khan, A.S., Singh, B.V., Agarwal, S.K. and Panwar, K.S. (1996). Insitu soil moisture conservation for optimizing production of fruit crops in sub-mountaneous Kandi Tract in Haryana. Annals of Biology 12: 215-220.

44 Singh, V., Katyal, S.K. and Panwar, K.S. (1996). Effect of application of biozyme with inorganic fertilizer on wheat (*Triticum aestivum*). Indian Journal of Agronomy 41(4): 566-567.

45 Rana, V.S., Bishnoi, K.C. and Kumar, A. (1996). Effect of different methods of sowing seed rate and fertility levels on the yield attributes and yields of late sown wheat. Haryana Journal of Agronomy 12(1). (*Other details not available*)

46 Raj, M., Saich, S.N. and Mehta, S.C. (1998). Growth and yield of mustard as affected by sources and time of application under dryland conditions. Annals of Agriculture-Biological Research 3: 67-70.

47 Yadava, D.K., Sangwan, R.S. and Dahiya, B.S. (1998). Studies on planting ratios for sunflower hybrid seed production. Crop Research 15(2-3): 250-255.

48 Ramesh Kumar, Sachan, P.L. and Midha, L.K. (1999). Performance of mustard under different irrigation and nitrogen levels. Haryana Journal of Agronomy 10(1): 114-116.

49 Midha, L.K., Panwar, K.S. and Sharma, S.K. (2000). Effect of levels and time on N application on quality of forage oats. Journal of Forage Research.

50 Panwar, K.S., Sharma, S.K. and Nanwal, R.K. (2000). Influence of sowing time on the yield of different mustard cultivars (*Brassica* sp.) under conserved soil moisture conditions. Indian Journal of Agriculture Sciences 70(6): 300-330.

51 Sharma, S.K., Panwar, K.S. and Nanwal, R.K. (2000). Intercropping studies of different fodder crops in Indian mustard (*Brassica juncea* L.) under conserved soil moisture conditions. Journal of Forage Research 25(4). (*Other details not available*)

52 Nanral, R.K., Sharma, S.K. and Panwar, K.S. (2001). Intercropping studies of different fodder crops in Indian mustard (*Brassica juncea* L.) under conserved soil moisture conditions. Forage Research. 27(1): 63-66.

53 Nanral, R.K., Panwar, K.S. and Sharma, S.K. (2001). Effect of drought weather conditions on pearlmillet and agronomic strategies for its management. Haryana Journal of Agronomy. 17(1and2): 80-83.

54 Aneja, B.R., Singh, S.N., Vireshwar singh and Kadia, V.S. (2001). Relative importance of dairy enterprises in mixed farming systems. Haryana Journal of Agronomy. 16(1-2): 83-85.

Hoshiarpur

1 Singh, Ranjodh, S.S. and Singh, N.T. (1974). A note on effect of nitrogen and spacing on the performance of rainfed bajra, Indian Journal of Agriculture Research 214-215.

2 Singh, Ranjodh, Singh, Y., Prihar, S.S. and Singh, P. (1975). Effect of N fertilization on yield and water use efficiency of dryland wheat as affected by stored water and rainfall. Journal of Indian Society of Soil Science 25: 175-181.

3 Meelu, O.P., Singh, Ranjodh and Sekhon, G.S. (1976). Fertilizer use and soil and crop management technology for rainfed areas of Punjab. Fertilizer News 21(9): 34-38.

4 Singh, Ranjodh, Gill, A.S. and Verma, H.N. (1976). Water use and yield of dryland wheat as affected by N and P fertilization in loamy sand. Indian Journal of Agronomy 21: 254-57.

5 Singh, Narinder. Singh, N., Singh, M.Y. (1976). Yield and profile water depletion pattern of rainfed Vijay maize as affected by N fertilization. Indian Journal of Agronomy 21(2): 249-253.

6 Dhillon, N.S., Singh, Y. and Singh, R. (1977). Fertilizer requirements of rainfed wheat in relation to different fertility levels of soil. Indian Journal of Ecology 2: 183-187.

7 Singh, R., Chandha, R.K., Verma, H.N. and Singh, Y. (1977). Response of dryland wheat to phosphorus fertilization as influenced by profile water storage and rainfall. Journal of Agriculture Science 88: 591-595.

8 Singh, Y., Singh, T.R. and Sekhon, G.S. (1977). Uptake of primary nutrients by dryland wheats as influenced by N fertilization in relation ot soil type, profile water storage and rainfall. Journal of Indian Society of Soil Science 25: 175-181.

9 Singh, Ranjodh. Verma, H.N., Singh, Piara and Singh, N. (1978). Performance of different varieties of gram, barley, rapeseed and mustard under rainfed sub-humid conditions. Indian Journal of Agronomy 23: 251-254.

10 Dass, B. and Singh, Ranjodh. (1979). Uptake of nutrients (N, K and P) by rainfed maize as affected by N application and soil type. Journal of Indian Society of Soil Science 27: 142-145.

11 Ali, M. (1979). Studies on weed management in sorghum on drylands of Bundelkhand. Indian Journal of Agronomy. 24: 150-155, 1979.

12 Verma, H.N., Prihar, S.S., Singh, Ranjodh. and Singh, Nathu. (1979). Yield of sub-humid rainfed crops in relation to soil and water retention and cropping sequence. Experimental Agriculture 14: 253-259.

13 Verma, H.N., Prihar, S.S., Singh, Ranjodh. and Chaudhary, T.N. (1979). Runoff as affected by rainfall characteristics and management practices on gently sloping sandy loam. Journal of Indian Society of Soil Science 27: 8-22.

14 Walia, R.S., Singh, Ranjodh. and Singh, Yadvinder. (1979). Yield and water use of dryland wheat as affected N fertilization. Journal of Indian Society of Soil Science 28: 91-97.

15 Ail, M. (1980). Effect of plants types and row spacing on clusterbeans production under dryland conditions. Indian Journal Agronomy. *(Other details not available)*

16 Walia, R.S., Ranjodh Singh and Yadvinder Singh. (1980). Growth and nutrient uptake behavior of dryland wheat as influenced by N fertilization. Journal of Indian Society of Soil Science. 21: 91-97.

17 Sharma, B.D. and Singh, Ranjodh. (1982). Distribution of nitrate N and uptake by rainfed maize as affected by method of application of urea. Indian Society of Soil Science 30: 44-47.

18 Kumar, Dinesh. and Singh, Ranjodh. (1984). Effect of farmyard manure on nitrogen use efficiency in maize - wheat sequence under rainfed conditions. Indian Society of Soil Science. 318-322.

19 Singh, Nathu and Singh, Yadvinder (1981). Residual moisture and yields of different varieties of bajra, groundnut and mash under rainfed sub-humid conditions of Punjab. Indian Journal of Economic, 8(2): 292-295.

20 Prihar, S.S. and Singh, Ranjodh. (1983). Advances in fertilizer management for rainfed wheat. Fertilizer News 28(9): 49-56. (*Other details not available*).

21 Singh, N., Singh, Ranjodh. Singh, Y. and Sandhu, K.S. (1984). Improving efficiency of fertilizer N when mixed with seed in dryland wheat. Indian Journal of Agriculture Science 54: 1092-1093.

22 Verma, H.N., Prihar, S.S. and Singh, Ranjodh. (1984). Feasibility and storage of runoff in dugout ponds and its use for supplemental irrigation in sub-montane Punjab. Indian Journal of Soil Conservation 12: 31-36.

23 Prihar, S.S., Verma, H.N., Sandhu, K.S. and Singh, Ranjodh. (1985). Growth and yield of rainfed sugarcane in relation to mulching and surface compaction on two soils. Indian Journal of Ecology 12: 62-66.

24 Singh, Narinder., Singh, N., Singh, Ranjodh. and Saggar, S. (1986). Evaluation of rainfed fodder in sub mountain Punjab. Forage Research 12(1): 33-36.

25 Singh, Ranjodh., Singh, N. and Singh, Y. (1986). Performance of different varieties of wheat in relation to soil type and rainfall under sub-humid conditions. Journal of Research (Phulbani Agriculture University) 24: 22-30.

26 Prihar, S.S. and Sandhu, K.S. (1987). Water and fertilizer management for rainfed agriculture. Fertilizer News 32(4): 31-36.

27 Prihar, S.S., Sandhu, K.S., Singh, Mukhtar., Verma, H.N. and Singh, Ranjodh. (1989). Response of dryland wheat to small supplemental irrigation and fertilizer nitrogen in submontane Punjab. Fertilizer Research 21: 23-28.

28 Hobhangu, Jaskiran, Singh. and Singh, Sukhvinder. (1993). Comparative performance of tomato cultivars under rainfed conditions of Kandi area (Punjab). Punjab Horticulture 33: 123-126.

29 Gill, M.S., Verma, H.N. and Singh, Sukhvinder. (1994). Response of wheat (*Triticum aestivum*) to improved practices under rainfed condition. Indian Journal of Agronomy 39: 557-559.

30 Verma, H.N., Gill, M.S. and Singh, Sukhvinder. (1994). Effect of N doses, seeding method and spacing on rainfed maize (*Zea mays*) yield. Himachal Journal of Agricultural Research 20 (1 and 2): 35-39.

31 Sandhu, K.S. and Sidhu, A.S. (1996). Response of dryland wheat to supplemental irrigation and rate and method of N application. Fertilizer Research 45: 135-142.

32 Bijay, Singh., Singh, Y., Maskina, M.S. and Meelu, O.P. (1997). The value of poultry manure for wetland rice grown in relation with wheat. Nutrient cycling in Agro-eco system 47: 243 - 250.

33 Sardana, V, Sharma, S.K. and Randhawa, A.S. (1999). Performance of wheat cultivars under different sowing dates and levels of nitrogen under rainfed conditions. Annals of Agricultural Research 20: 60-63.

34 Verma, H.N., Singh, Sukhvinder and Narang, R.S. (1999). Yield of rainfed wheat (*Triticum aestivum*) in relation of seeding zone moisture and seed rate. Indian Journal of Agronomy. 44: 548-553.

35 Singh, Sukhvinder, Verma, H.N., Gill, M.S. and Narang, R.S. (2000). Performance of wheat-raya intercropping under rainfed conditions of Kandi of Punjab. Journal of Research, Punjab Agricultural University 37: 15-19.

Hyderabad

1 Chetty, C.K.R., Narayana Reddy, M. (1979). Effect of uneven stands due to variable spacing and suboptimal plant population on grain yield of sorghum. Indian Journal of Agricultural Sciences 49(4): 280-3.

2 Vijayalakshmi, K. and Vittal, K.P.R. (1980). Wide row planting of sorghum on par with normal plant on real farm situations. Sorghum Newsletter 23, 51-53.

3 Vijayalakshmi, K. and Vittal, K.P.R. (1981). Rainfwater harvesting and recycling in semi-arid red and seirozem soils. Journal of Indian Society of Soil Conservation. 9: 87-96.

4 Rao, C.H., Sanghi, N.K., Rao, U.M.B. (1981). Sorghum yield in relation to physiological maturity. Indian Journal of Agriculture science. 51: 9.

5 Rao, C.H., Hamilton, R.I. and Rao, U.M.B. (1981). Effect of nipping different sequential orders on the yields of Aruna castor. Journal of Indian Society of Soil Science. 51: 7.

6 Venkateswarlu J. (1981) Improved dry farming systems for India, The Andhra Agriculture Journal 28: 21-24.

7 Venkateswarlu, J. (1981). Maximisation of crop production in drylands. Indian Journal of Soil Conservation 9: 124-141.

8 Vijayalakshmi, K. and Vittal, K.P.R. (1981). Rainwater harvesting and recycling in semi-arid red and sierozem soils, Indian Journal of Soil Conservation, 9 (2 and 3): 87-101.

9 Hanumantha Rao, C., Hamilton, R.I. and Bhaskara Rao, U.M., (1981). Effect of nipping differential spike orders on the yield of Aruna Castor. Indian Journal of Agricultural Sciences, 51(7): 351-352.

10 Narayana Reddy, M. and Ramanatha Chetty, C.K. (1981). Uniformity trials on sorghum and pearlmillet under dryland conditions. Andhra Agricultural Journal, 26 (5 and 6): 160-164.

11 Ramanatha Chetty, C.K. (1981). Experimental land management and statistical requirement in experimentation. Andhra Agricultural Journal, 27(3 and 4): 243-250.

12 Narayana Reddy, M., and Ramanatha Chetty, C.K. (1983). Modified use of Smith's law for coefficient of heterogenity on the basis of field experiments conducted on the size and shape of plots and blocks for dryland castor. Indian Journal of Agricultural Sciences, 53: 250-255.

13 Vittal, K.P.R., Vijayalakshmi, K. and Rao, U.M.B. (1983). Effect of deep tillage on dryland crop production in red soils of India. Soil and Tillage Research. 3: 377-384.

14 Korwar, G.R. and Friesen, G.H. (1984). Control of witch weed (*Striga asiatica)* in sorghum. Tropical Pest Management 39(1): 14-17.

15 Rao, K.P.C. (1984). Casurina plantations in coastal Andhra Pradesh - Their economics vis-à-vis the competing annual crops. Agriculture Situation in India, 39(7): 211-215.

16 Reddy, Y.V.R. (1984). Economic analysis of fingermillet (*Eleusine coracana*) cultivation in Karnataka state. The Andhra Agriculture Journal. 31(2): 113 - 118.

17 Reddy, Y.V.R. and Rastogi, B.K. (1984). A study on production and consumption of milk in arid and semi-arid regions of India. Livestock advisor, 9(12): 5 -10.

18 Rangacharya, B., Vijayalakshmi, K., Vittal, K.P.R. and Rao, U.M.B. (1985). Effect of finer soil fraction as sealant against seepage losses in Entisols. Journal of Indian Society of Soil Conservation. 13: 45-48.

Indore

1 Mishra, V.K., Sharma, R.A., Holkar, S., Mishra, V.K., Sharma, R.A. and Holkar, S. Influence of soil water potential on seedling emergence, plumule and radicle growth of wheat, gram, safflower and linseed. Crop Research. 5(3): 407-411. (*Other details not available*)

2 Gupta, R. K., Tembe, G. P. and Gupta, U.S. (1976). Evaluation of ring and basin infiltrometers use in black soils. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal. 10, 127-131.

3 Sharma, S.G., Verma, G.P., Sharma, R.A. and Bhargava, B.S. (1976). Moisture content and bulk density relationships of a vertisols. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal 10 (2): 115-117. (*Other details not available*)

4 Gupta, R.K.and Sharma, S.G., Tembe, G.P. and Tomar, S.S. (1978). A new approach in farming system for problem soils of Madhya Pradesh. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal. 12, 73-79.

5 Gupta, R.K., Tomar, S.S.and Tomar, A.S. (1979). Improved management practices for maize and sorghum grown on vertisols of central India. Journal of Agronomy and Crop Science. 148, 478-483.

6 Shukla, N.K., Katre, R.K., Rai, M.M. and Jain, S.C. (1980). Water quality in semi-arid vertisols of Indore, Madhya Pradesh. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal. 14 (1 and 2). (*Other details not available*)

7 Sharma, O.P., Katre, R.K. and Saran, R.N. (1980). Study of rooting pattern by pin board method in black soils of Malwa. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal.14:(1 and 2). (*Other details not available*)

8 Shinde, S.S., Magar, S.S., and Kale, S.P. (1982). Effect of soil, physical conditions and initial soil moisture content on infiltration in black soil. Journal of Indian Society of Soil Science. 30, 441-445.

9 Sharma, R.A., Verma, G.P., Ram, K. Gupta and Katre, R.K. (1982) Moisture depletion pattern and use by unirrigated wheat and safflower grown on vertisols as influenced by cultural practices. Zeitung Acker – und Pflanzenbau (Journal of Agrononmy and Crop Science), 151, 267-274.

10 Gupta, R.K., and Verma, S.K. (1983). Water behaviour of black clay soil as influenced by sodicity. Current Agriculture. 7, 114-121.

11 Sharma, R.A., Verma, G.P. and Ram K. Gupta. (1983). Hydraulic properties of black clay soil of malwa. Jawaharlal Nehru Krishi Viswa Vidyalaya Research Journal. 17(1 and 2): 88-91.

12 Ambegaonkar, P.R., Varade, S.V. and Bharambe, P.R. (1984). Infiltration characteristics of vertisol. Journal of Indian Society of Soil Science. 32, 218-233.

13 Sharma, R.A. and Gupta, R.K. (1984). Soil water evaporation from clay and sandy loam soils as influenced by straw and dust mulching. Indian Journal of Soil Conservation. 12(1): 49-57.

14 Sharma, R.A., Upadhyay, M.S. and Tomar, R.S.S. (1985). Water use efficiency of some rainfed crops on a vertisol as influenced by soil and straw mulching. Journal of Indian Society of Soil Science. 33, 387-391.

15 Sharma, R.A., Verma, G.P. and Gupta, R.K. (1985). Modification of evaporation from a vertisol by straw mulch. Journal of Indian Society of Soil Science. 33, 383-386.

16 Singh, B.R., Sharma, R.A. and Ram K. Gupta. (1985). Influence of soil water potential on emergence, plumule and radicle growth of wheat, gram and safflower in a clay soil. Seed Research. 13(1): 186-191.

17 Ram K. Gupta., Sharma, R.A. and Singh, B.R. (1985). Growth parameters of safflower (*Carthamus tinctorius*) in relation to changing soil water potential. Indian Journal of Plant Physiology. 28(3): 264-270.

18 Sharma, R.A., Ram K. Gupta and Singh, B.R. (1986). Moisture use by safflower in relation to changing soil water potential. Journal Indian Society of Soil Science. 34: 393-95.

19 Sharma, R.A., Ram K. Gupta, and Rajesh Sharma. (1986). Influence of soil water potential on the growth of barley. Journal of Indian Society of Soil Science. 34: 707-12.

20 Shrivastava, N.C. (1987). Runoff harvesting and supplemental irrigation studies on vertisol of Malwa plateau. Indian Journal of Dryland Agriculture Research and Development. 1, 25-31.

21 Sharma, R.A. (1987). Effect of phosphorus application on rainfed sorghum in vertisols of Indore. Journal of Indian Society of Soil Science. Vol. 35: 158-60.

22 Sharma, R.A. and Vipin, Thukral. (1987). Influence of rainfall distribution on the possibilities of double cropping under rainfed conditions. Journal of Indian Society of Soil Science. Vol. 35: 282-85.

23 Verma, S.K., Jethamalani and Sharma, R.A. (1987). Studies on irrigation scheduling for different kharif and *rabi* crops based on open pan evaporation for black clay soils of malwa region. Indian Journal of Agriculture Research. 21(3): 139-145.

24 Sharma, R.A. and Dixit, B.K. (1987).Effect of nutrient application of rainfed soybean. Journal of Indian Society of Soil Science. Vol. 35: 452-55.

25 Raghav, H.S., Sharma, R.A. and Mishra, O.R. (1987). A note on water use pattern of different wheat varieties grown on vertisols in relation to limited irrigation. Indian Journal of Soil Conservation 15(1). (*Other details not available*)

26 Sharma, R.A., Verma, G.P. and Upendra Shankar. (1987). Rainfall characteristics and crop planning for dyrlands on vertisols of Indore region. Indian Journal of Dryland Agriculture Research and Developmant. 2, 17-24.

27 Sharma, R.A. and Rajesh Sharma. (1987). Seeding growth of barley in relation to varying levels of soil water potential. Seed Research. 15(2): 133-137.

28 Tomar, R.S.S., Upadhyay, M.S. and Sharma, R.A. (1987). Effect of planting pattern in pigeonpea + soybean intercropping system. Indian Journal of Agronomy. 32(4): 322-325.

29 Sharma, R.A. and Dixit, B.K. (1987). Effect of varying soil water potentials on seeding emergence, growth and transipiration of soybean. Journal of Indian Society of Science. 36: 205-210.

30 Sharma, R.B., Jain, V.K., Sharma, R.A. and Verma, S.K. (1987). Influence of different levels of nitrogen on yield and protein content of different varieties of ragi (*Elueusine coracana Gaertn*) grown under rainfed conditions. Agriculture Science Digest, 8(3): 161-164.

31 Sharma, R.A., Verma, S.K. and Dxiit, R.K. (1987). Response of sorghum to different levels of phosphorus under rainfed conditions in a clay soil. Indian Journal of Agriculture Research. 22(4): 203-208.

32 Sharma, R.A. and Verma, G.P. (1987). Moisture contribution by deeper soil layers during reproductive phase of rainfed wheat and safflower. Progress in ecology 10: 317-328.

33 Sharma, R.A. and Verma, G.P. (1987). Soil thermal regimes of black clay soil as influenced by thickness of wheat straw mulch. Progress in ecology 10: 355-366.

34 Rande DH and Gupta Ram K. (1989). A note on reducing runoff from sodic clay soils. Indian Journal Soil Science. 15:111-112.

35 Verma, S.K., Ram K. Gupta., and Sharma R.A. (1989). Field studies on leaching behaviour of sodic clay soil. Journal of Indian Society of Science. 37: 809-814.

36 Nigam, P.K., Mishra, V.K. and Sharma, R.A. (1989). Performance of different soybean (*Glycine Max* L. Merril) varieties grown on black clay soils under rainfed conditions. Legume Research, 12(3): 143-147.

37 Sharma, R.A. (1990). Land and water use efficiency of different rainfed crops in relation to nutrient application. Crop Research. 3(2): 129-136.

38 Upadhyay, M.S., Sharma, R.A., Shivaji Yadav, Gupta, R.K. and Billore, S. (1990). Studies on population densities of component crops in sorghum/pigeonpea intercropping. Indian Journal of Agronomy. 35(1and2): 60-66.

39 Nigam, P.K., Sharma, R.A., Mishra, V.K. and Gupta, R.K. (1990). Production potential, water use and water use efficiency of some soybean (*Glycine max* (L.) Merril) cultivars grown on vertisols under rainfed conditions of Malwa region. Indain Journal of Agronomy. 35 (1 and 2): 178-180.

40 Sharma, R.A. (1990). Increasing water use efficiency of crops through efficient irrigation and soil moisture conservation. Journal of NATCON. 2(2), P. 87-97.

41 Nigam, P.K., Sharma, R.A., Mishra, V.K., Holkar, S. and Billore, S.D. (1990). Phenotypic stability of seed yield, dry matter and water-use efficiency of soybean (*Glycine max*) under rainfed condition. Indian Journal of Agricultural Sciences. 60(3): 185

42 Sharma, D.N., Khaddar, V.K., Sharma, R.A. and Singh, D. (1991). Effect of different doses and sources of sulphur on the quality and yield of mustard. Journal of Indian Society of Soil Science. 39: 197-200.

43 Jain, S.K., Shivaji, yadav., Sharma, R.A. and Sharma S.R. (1991). Growth, yield, yield contributing characters and quality of sugarcane varieties grown in Madhya Pradesh. Crop Research. 4(1): 30-33.

44 Upadhyay, M.S., Sharma, R.A. and Gupta, R.K. (1991). Response of soybean and pigeonpea intercropping system to phosphorus fertilization in vertisols under rainfed conditions. Journal of NATCON. 3(2): 197-203.

45 Sharma, R.A. (1991). Crop responses to phosphorus in black clay soil of central India under rainfed conditions. Agriculture Reviews 12(3): 121-130.

46 Holkar, S., Mishra, V.K. and Nigam, P.K. (1991). Phenotypic stability of yield and its components in rainfed soybean. Journal of Maharasthra Agriculture University. 16(3): 435-36.

47 Sunil Holkar, Mishra, V.K. and Billore, S.D. (1991). Phenotypic stability of seed yield in pigeonpea (*Cajanus cajan* L. Mill.) under dryland conditions. Crop Research. 4(2): 247-252.

48 Sunil Holkar, Billore, S.D. and Singh, C.B. (1991). Genetic variability for yield and its attributing character in pigeonpea. Narendra Dev Journal of Agriculture Research. 6(1): 217-219.

49 Holkar, S., Jagtap, J.G., Billore, S.D. and Mishra, V.K. (1991). Evaluation of soybean (*Glycine max*) and pigeonpea (*Cajanus cajon*) genotypes grown in intercropping system. Indian Journal of Agricultural Sciences 61 (2): 93-6.

50 Sharma, R.A. (1992). Efficient water use and sustainable production of rainfed soybean and safflower through conjuctive use of organics and fertilizer. Crop Research. 5(2): 181-194.

51 Sharma, R.A. and Vipin Thukral. (1992). Yield and water use efficiency of different rainfed crops in relation to nutrients application in black clay soils of central India. Indian Journal of Agriculture Research. 26(1): 45-50.

52 Sharma, R.A. and Gupta, R.K. (1992). Response of rainfed soybean (*Glycine max*)-safflower (*Carthamus tinctorius*) sequence to nitrogen and sulphur fertilization in vertisols. Indian Journal of Agricultural Sciences 62(8): 529-34.

53 Mishra, V.K., Sharma, R.A. and Holkar, S. (1992). Influence of soil water potential on seedling emergence, plumule and radicle growth of wheat, gram, safflower and linseed. Crop Research. 5(3): 407-411.

54 Sharma, R.A. (1992). Influence of integrated fertility management on productivity and water use efficiency of rainfed soybean. Crop Research. S: 52-58.

55 Mishra, O.R., Sharma, R.A. and Pandya, N. (1992). Influence of different levels of phosphorus and sulphur on yield and quality of linseed grown on black clay soils. Journal of NATCON, 4(2), 111-115.

56 Billore, S.D., Upadhyay, M.S. and Holkar, S. (1992). Effect of pigeonpea plant population on the productivity of sorghum in intercropping production complex. Crop Research 5(3): 426-429.

57 Holkar, S., Billore, S.D. and Mridula Bargale. (1992). Effect of sole and intercropping system on growth attributes of soybean genotypes. Crop Research. 5(3): 434-439.

58 Sunil Holkar and Jagtap, J.G. (1992). Performance of sorghum (*Sorghum bicolor*) genotypes for intercropping with pigeonpea (*Cajanus cajan*). Indian Journal of Agricultural Sciences 62(10): 653-6.

59 Billore, S.D., Mishra, V.K., Holkar, S. and Mridula Bargale. (1992). Heat unit efficiency in soybean. Research and Development Reporter, 9(1and2): 73-78.

60 Jagtap, J.G., Gupta, R.K. and Holkar, S. (1993). Evaluation of soybean (*Glycine max*) and pigeonpea (*Cajanus cajan*) varieties for advantage in intercropping on the basis of stability analysis. Indian journal of Agricultural Sciences 63(6): 327-32.

61 Ranade, D.H., Gupta, Ram K. and Jain, L.K. (1993). Effectiveness of LDPE film in reducing seepage losses from big farm ponds. Indain Journal of Soil Conservation. 21(1): 96-97.

62 Ranade, D.H., Gupta, Ram K., Jain, L.K. and McCool, D.K. (1992). Comparative performance of different sealant materials for seepage control. Indian Journal Soil Conservation. 21(2): 1-5.

63 Gupta, R.K. and Sharma, R.A. (1994). Influence of different land configuration on insitu conservation of rainwater, soil and nutrients. Crop Research. 8(2): 276-282.

64 Mishra, O.R., Kundlia, S.C. and Sharma R.A. (1994). Influence of fertility levels, cycocel, rhizobiamcnltBl.lp and JF'Y moa growth and yield of soybean. Crop Research. 7(1): 156-158.

65 Sharma, N.K., Dubey, D.D. and Sharma, R.A. (1994). Potassium status of Sarol and Malikhedi soil series of Madhya Pradesh. Crop Research. 7(1): 17-24.

66 Thakur, D.S., Dubey, D.D., Sharma, O.P. and Sharma, R.A. (1994). Distribution pattern of potassium content in different size particles of two usterts of central India. Crop Research. 7(1): 25-29.

67 Sharma, N.K., Dubey, D.D., Dighe, J.M. and Sharma, R.A. (1994). Quantity and intensity parameters of potassium in vertisols and associated soils. Crop Research. 8(1): 60-65.

68 Mishra, O.R. and Sharma, R.A. (1994). Soil fertility and productivity problems of black soils and their management. Journal of NATCON 6(1):11-18.

69 Ranade, D. H., Sharma, R.A., Gupta, R.K. and Patel, A.N. (1995). Effect of mechanical and vegetative barriers on conservation of runoff, soil and plant nutrients. Crop Research. 9(2): 218-223.

70 Mishra, V.K., Sharma, R.A., Nigam, P.K. and Joshi, R.C. (1995). Hydro-physiological characterization of some promising soybean cultivars grown on black soils. Crop Research. 9(2): 211-214.

71 Mishra, O.R., Tomar, U.S., Sharma, R.A. and Rajput, A.M. (1995). Response of maize to chemical and bio-fertilizers. Crop Research. 9(1): 233-237.

72 Sharma R.A. and Saran, R.N. (1995). Current status, production constraints and scope of pigeonpea cultivation in rainfed vertisols and associated soils of western Madhya Pradesh – a review. Agriculture Review. 16(2): 57-62.

73 Sharma, R.A. (1995). Characaterization and management of resources for sustainable productivity of soybean – a review. Agriculture Reviews. 16(4): 186-202.

74 Jagtap, J.G. and Holkar, S. (1995). Horizontal and vertical stability in pigeonpea. Indian Journal of Dryland Agriculture Research and Development. 10(1): 79-83.

75 Mishra, V.K., Ranade, D.H., Gupta, Ram K. and Solanki, C.M. (1995). Hydrological behaviour and rooting pattern of some grass species in vertisols. Journal of Indian Society of Soil Science. 43(4): 545-549.

76 Ranade, D.H., Chourasia, M.C., Upadhyay, M.S. and Nema, R.S. (1995). Integrated approach for increased agricultural productivity in dryland area of vertisols. Indian Journal of Soil Conservation. 23(1): 30-33.

77 Ranade, D.H., Gupta, Ram K. and Patel, A.N. (1995). Quantification of runoff associated soil loss from vertisols. Crop Research. 10(1): 28-34.

78 Deshmukh, S.C., Joshi, R.C. and Singh, N.K. (1996). Performance of sorghum varieties (*Sorghum biocolor*) varieties on a partially reclaimed sodic soil under different levels of nitrogen. Indian Journal of Agronomy. 41(4): 591 - 592.

79 Deshmukh, S.C., Patel, B.C. and Girethia, O.P. (1996). Response of new cotton varieties to nitrogen and planting geometry in sodic soils. Journal of Cotton Research and Development. 10(2): 162 - 165.

80 Deshmukh, S.C.,Tiwari, S.C. (1996). Efficiency of slow release nitrogen fertilizers in rice (*Oryza sativa*) on partially reclaimed sodic vertisols. Indian Journal of Agronomy.41: 544 - 47.

81 Kool, F.M., Deshmukh, S.C. and Nema, D,P. (1996). Productivity of soybean as influenced by water table depth in vertisols. Journal of Maharashtra Agriculture University. 21: (2) 48.

82 Sharma, R.A. (1996). Effect of different land treatments on in-situ conservation of rainwater soil and plant nutrients in black clay soils of Madhya Pradesh. Agriculture Science Digest. 16(1): 13 - 14.

83 Dawanda, W.D., Patel, O.P. and Deshmukh, S.C. (1997). Root distribution studies in guava under semi-arid subtropical conditions. Indian Journal of Horticulture. 54(3), 220 - 222.

84 Kumrawat, B., Dighe, J.M., Sharma, R.A. and Katti, G.V. (1997). Response of soybean to biofertilizers in black clay soils. Crop Research. 14(2), 209 - 214.

85 Mishra, V.K., Ranade, D.H. and Gupta, R.K. (1997). Comparative evaluation of vegetative soil and water conservation measures based on overall performance index. Indian Journal of Soil Conservation. 25(2), 103 -105.

86 Mishra, V.K., Ranade, D.H., Joshi, R.C. and Sharma, R.A .(1997). Soil conservation values of different grass species in vertisols. Crop Research. 13(2): 507 - 509.

87 Ranade, D.H. and Jain, I.K. (1997). Modelling maximum rainfall intensity at Indore. Karnataka Journal of Agricultural Sciences. 10(2): 538 - 539.

88 Ranade, D.H. and Jain, I.K. (1997). Probability analysis of annual maximum rainfall for Indore region. Karnataka Journal of Agricultural Sciences. 10(2), 536 - 537.

89 Ranade, D.H., Gupta, R.K. and Jain, I.K. (1997). Computation of crop water requirement of sorghum and soybean. Karnataka Journal of Agricultural Sciences. (2) 540 -545.

90 Ranade, D.H., Jain, L.K., Gupta, R.K. and McCool, D.K. (1997). Comparative performance of mechanical and vegetative soil conservation measures in vertisols. Indian Journal of Soil Conservation. 25(3): 182-185.

91 Rande, D.H., Gupta, R.K. and Patel, A.N. (1997). Predicting runoff of Malwa region. Crop Research. 11: (2) 9-16.

92 Sharma, R.A. (1997). Influence of conjunctive use of organics and fertilizer nutrients on nutrient uptake and productivity of soybean- safflower cropping sequence in a typic chromusterts. Crop Research. 13(2): 321 -325.

93 Sharma, R.A. (1997). FYM and fertilizer use in relation to growth, yield and nutrient uptake by soybean. Crop Research. 13(1). 51 - 57.

94 Sharma, R.A., Armar, B.B. (1997). Influence of bio fertilizers and indigenous source of nutrients on nutrient uptake and productivity of rainfed soybean - gram sequence. Crop Research. 13(1), 13-18.

95 Sharma, R.A., Bahdoria, N.S. and Mishra, O.R. (1997). Yield, dry matter production and nutrient uptake by hybrid sorghum as influenced by split application of nutrients. Crop Research. 13(1), 211 -212.

96 Thakur, D.S., Dubey, D.D., Sharma, O.P. and Sharma, R.A. (1997). Physico-chemical properties and forms of iron in two usferts of central and peninsular India. Crop Research. 13(1): 211-212.

97 Sharma, R.A. and Mishra, O.R. (1997). Crop residues, FYM and fertilizer use in relation to growth yield and nutrient uptake by soybean. Crop Research. 13(1): 51-57.

98 Ranade, D.H. and Jain L.K. (1997). Extreme events and their effect on rainfall paratmers at Indore. Karnataka Journal of Agriculture Science. 10(4): 971-976.

99 Jagtap, J.G. and Holkar, S. (1998). Evaluation of soybean (*Glycine max*) and pigeonpea (*Cajanas cajan*) lines for advantage in intercropping system. Indian Journal Agriculture Science. 68(5): 241 - 243.

100 Mishra, O.R., Nigam, S.K., Gautam, V.S., Sharma, R.A. and Rajput, A.M. (1998). Productivity and economic assessment of different cropping systems in black clay soils. Crop Research. 15 (2 and 3): 165 - 167.

101 Nema, R.S., Jain, L.K. and Sharma, R.A. (1998). Effectiveness of different lining materials in seepage control from dug out farm ponds. Crop Research. 15(2 -3): 185- 187.

102 Sharma, R.A., Nema, R.S., Chourasia, M.C., Upadhyay, M.S. and Gupta, R.K .(1998). Impact of different components of dryland technology in raising the productivity of watershed area of Indore, M. P. Crop Research Journal. 16(2): 162 -167.

103 Thakur, H.S., Sinha, N.K., Raghuwanshi, R.K.S. and Sharma, R.A. (1998). Response of gram (*Cicer arietinum*) varieties to plant population and date of sowing. Indian Journal of Agronomy 43(2): 315-317.

104 Sharma, R.A. (1998). Current status and constraints to higher productivity of pulses: a review. Agriculture Reviews. 19(4): 264-269.

105 Sharma, R.A. Weekly initial and conditional probabilities of rainfall during rainy season in western Madhya Pradesh. Crop Research. 5: 193-198. *(Other details not available)*

106 Gupta, R.S., Banafar, R.N.S. and Sharma, R.A. (1999). Effect of straw mulch and irrigation on root distribution pattern and yield of pomegranate (*Punica granatum*). Crop Research. 17(1), 100 - 103.

107 Sharma, R.A. (1999). Management of crop residue and farmyard manure for sustainable productivity of rainfed soybean and safflower and soil health under rainfed conditions. Crop Research. 18(3): 370-372.

108 Ranade, D.H., Chourasia, M.C., Gupta, Ram K., Nema, R.S., Upadhyay, M.S. and Jain, L.K. (1999). Increasing ground water availability through soil conservation measures. Indian Journal of Soil Conservation. 27(3): 258-260.

109 Vishwakarma, S.K., Ranade, D.H., Paradkar, V.K., Jain, L.K. and Tomar, A.S. (1999). Probability analysis of rainfall at Chhindwara (M.P.). Journal of Agriculture Engineering. 36(4): 75-76.

110 Thakur, H.S., Sharma, R.A., Nadkarni, P.G. and Raghuvanshi, R.K.S. (2000). Studies on the influence of different degrees of tillage operations on soybean cropping system grown on vertisols of central India. Crop Research. 19(1): 17-22.

111 Vishwakarma, S.K., Ranade, D.H., Paradkar, V.K., Jain, L.K. and Tomar, A.S. (2000). Probability analysis of wet and dry spells for agricultural planning at Chhindwara. Indian Journal of Agriculture Science. 70(10): 719-721.

112 Sharma, N.K., Khaddar, V.K., Shivaji, Yadav., Mishra, O.R. and Sharma, R.A. (2000). Agronomic efficiency of sulphur fertilizers and its effect on seed yield and chemical composition of soybean in black clay soil under rainfed conditions. Research on Crops. 2(1): 25-29.

113 Chauhan, S.S., Dighe, J.M. and Sharma, R.A. (2001). Studies on utilization of available nutrients by sorghum genotypes in black cotton soils of Indore, M.P. Crop Research. 21(3): 268-270.

114 Thakur, H.S., Raghuwanshi, R.K.S., Sharma, R.A. and Sinha, N.K. (2001). Long term effects of sulphur and zinc fertilization in soybean (*Glycine max*)-wheat (*Triticum aestivum*) cropping system. Crop Research. 21(3): 283-286.

115 Sharma, R.A. (2001). Conservation of natural resources and their efficient utilization for enhanced sustainable productivity in black soil regions of central India – a review. Agriculture Reviews. 22(3/4): 183-193.

116 Sharma, R.A., Sigh, V., Chauhan, S. and Sharma, R.A. (2001). Studies on influence of various levels and sources of sulphur on seed yield and biochemical composition of soybean (*Glycine max* (L.) Merrill). Research on Crops. 2(3): 317-319.

117 Ranade, D.H., Vishwakarma, S.K., Jain, L.K., Narulkar, S.M. and Tomar, A.S. (2001). Performance of gully plough structures (Gabion) in black clay soil region – a case study. Indian Journal of Soil Conservation. 29(1): 88-90.

118 Ranade, D.H., Gupta, Ram K., Mishra, V.K. and Jain, L.K. (2001). Trapping the silt particles through vegetation barriers in black soil. Journal of Indian Society of Soil Science. 49(2): 391-392.

119 Ranade, D.H., Tomar, A.S., Jain, L.K. and Vishwakarma, S.K. (2001). Reduction in seepage rate and storage capacity of a dugout pond – a case study. Journal of Soil and water Conservation, 45 (1 and 2): 50-52.

120 Tomar, A.S. and Ranade, D.H. (2001). Pan coefficient determination for evapo-transpiration at Indore, Madhya Pradesh. Indian Journal of Soil Conservation. 29(2): 173-175.

121 Tomar, A.S. and Ranade, D.H. (2001). Predicting consecutive day maximum rainfall from one-day maximum rainfall for Indore region of Madhya Pradesh. Indian Journal of Soil Conservation. 29(3): 271-275.

122 Tomar, A.S. and Ranade, D.H. (2001). Predicting rainfall probability for irrigation scheduling in black clay soil Indore region of Madhya Pradesh. Indian Journal of Soil Conservation. 29(1): 82-83.

123 Tomar, A.S. and Ranade, D.H. (2001). Study on the association of rainfall amount with rain events for Indore, Madhya Pradesh. Indian Journal of Soil Conservation. 29(3): 276-279.

124 Tomar, A.S. and Ranade, D.H., Jain, L.K., Paradkar, V.K. and Vishwakarma, S.K. (2001). Forecasting monthly rainfall by Gompertz curve technique. Journal of Soil and Water Conservation. 45 (3 and 4): 127-128.

125 Tomar, A.S. and Ranade, D.H., Jain, L.K., Paradkar, V.K. and Vishwakarma, S.K. (2001). Predicting monthly rainfall for Chhindwara region by using Gompertz curve technique. Research on Crops. 2(2): 251-252.

126 Tomar, A.S. and Ranade, D.H., Jain, L.K., Paradkar, V.K. and Vishwakarma, S.K. (2001). Analysis of drought, dry and wet spells at Chhindwara in Madhya Pradesh. Indian Journal of Soil Conservation. 29(3): 268-270.

127 Vishwakarma, S.K., Ranade, D.H., Paradkar, V.K. and Tomar, A.S. (2001). Estimation of annual maximum rainfall by probability models for Chhindwara, Madhya Pradesh. Jawaharlal Krishi Vishwa Vidyalaya Research Journal. 35(1and2): 52-55.

128 Chauhan, S.S., Digue, J.M. and Sharma, R.A. (2002). Economics of sorghum production under different levels of fertility in Malwa region. Crop Research. 23(3): 428-430.

129 Chauhan, S.S., Dighe, J.M. and Sharma, R.A. (2002). Studies on nitrogen and phosphorus balance in black clay soil under rainfed sorghum. Research on Crops. 3(2): 359-362.

130 Ranade, D.H., Jain. L.K., Vishwakarma, S.K. and Tomar, A.S. (2002). Effectiveness of gully plug structures (gabion) for retaining silt load in gullied portions. Indian Journal of Soil Conservation. 30(2): 190-195.

131 Tomar, A.S. and Ranade, D.H. (2002). Predicting cumulative rainfall deficits by Gompertz growth model. Indain Journal of Soil Conservation. 30(1): 101-103.

Jhansi

1 Arya, R.L., Niranjan, K.P., Singh, A. (1997). Effect of nitrogen and phoshphorus on the productivity of grain sorghum (*Sorghum bicolor*) and dolichos intercropping systems. Indian Journal of Agronomy. 43(3): 401 - 404.

2 Arya, R.L., Niranjan, K.P., Singh, A., Singh, J.B. (1998). Productivity of forage based farming systems with farm boundary plantations shisham (*Dalbergia sissoo*) under rainfed conditions. Indian Journal of Agronomy. 10(1): 116 – 118

3 Ali, M., and Rawat, C.R. (1981). Response of groundnut varieties to phosphate application under dryland conditions. Indian Journal of Agronomy. 26: 71-76.

4 Chatterjee, B.N., Gill, A.S., Singh, G.S., Ali, M., and Marti, S. (1981). Agronomic research on forage and pasture crops. Quarter century of agronomic research in India. Silver Jubilee Publication, 1955-80. Indian Society of Agronomy. 25: 247

5 Gill, A.S., Arya, R.L., Singh, A. and Niranjan, K.P. (1999). Integrated nutrient management in food-forage cropping system under rainfed conditions. Indian Journal of Dryland Agriculture Research and Development. 14(1): 31-35.

6 Arya, R.L., Niranjan, K.P., Singh, A. and Singh, J.B., (2000). Production potential and sustainability of food-fodder alleys under rainfed conditions. Indian Journal of Agriculture Science. 70(2): 11-13.

Jodhpur

1 Singh, H.P., Singh, R.P.. Singh, Kailash. (1979). Effect of bentonite sub-surface moisture barrier and runoff concentration on soil moisture storage and yield of tinda grown in the sandy soils. Indian Journal of Agricultural Science. 49(11), 880-885.

2 Singh, R.P., Singh, H.P., Daulay, H.S. and Singh, K.C. (1981). Effect of periodical application of nitrogen in organic and inorganic form on the yield of pearlmillet. Indian Journal of Agricultural Science. 51(6) 409-416.

3 Singh, R.P., Singh, H.P., Daulay, H.S. and Singh, K.C. (1981). Fertilization of rainfed greengram-pearlmillet sequence. Indian Journal of Agricultural Sciences. 51(7): 498-503.

4 Daulay, H.S. and Singh, K.C. (1982). Effect of N and P rates and plant densities on yield of rainfed sesame. Indian Journal of Agricultural Science 52(3): 166-169.

5 Daulay, H.S., Singh, K.C. (1982). Chemical weed control in greengram and cluster bean. Indian Journal of Agricultural Science. 52(11): 321-323.

Kovilpatti

1 Rathnaswamy, R., Krishnasamy, R., Veerasamy, S., Iyemperumal, P. and Marrappan, V. (1977). CO3 greengram - A new short duration strain for drylands. Madras Agriculture Journal. 64(7): 451-453.

2 Rajamannar, A., Palanisamy, N., Krishnamoorthy, K.K. and Subramanian, A. (1978). A note on the levels and mode of application of phosphorus on the uptake of nutrients in two varieties of blackgram (*Vigna radiata* var. Mung). Madras Agriculture Journal. 65: 349-350.

3 Muthuvel, P., Kandaswami, P. and Krishnamoorthy, K.K. (1979). Organic carbon and total N content of soil under long term fertilization. Journal of Indian Society of Soil Science.27: 126-128.

4 Mompara, B.A. (1981). Dialel analysis of forage yield and its components in sorghum. Madras Agriculutral Journal, 68(5): 340-253.

5 Subramanian, N., Sankaralingam, A., Dason, A.A., Devotta, A.D., Bhagavandoss, M. and Ravikumar, V. (1982). Varietal and nitrogenous fertilizer responses to bacterial blight in rainfed cotton. Madras Agriculture Journal. 69(6): 390.

6 Muthuvel, P., Kandaswami, P. and Krishnamoorthy, K.K. (1982). Effect of longterm fertilization on the water shedding capacity, bulk density and porosity of soils. Madras Agriculture Journal. 69: 614-617.

7 Muthuvel, P., Kandasamy, P. and Krishnamurthy, K.K. (1982). Effect of continuous fertilization on changes on moisture holding capacity, bulk density and porosity in soil. Madras Agriculture Journal. 69: 614-617.

8 Muthuvel, P. and Manickam, T.S. (1982). Effect of varying levels of NPK on sunflower and on the succeeding crop. Madras Agriculture Journal. 69(12): 815-820.

9 Muthvel, P. and Rajkannu, K. (1983). Effect of Mg and S on Sunflower. Madras Agriculture Journal. 70(2): 130.

10 Muthvel, P., Habeebullah, B. and Chamy, A. (1983). Effect of presoaking of sunflower seeds in micronutrients on seed and oil yield. Madras Agriculture Journal. 70(6): 375-376.

11 Muthvel, P., Manickam, T.S., Subramanian, T.S. and Rajkannu, N. (1983). Effect of N levels on sunflower population. Madras Agriculture Journal. 70(4): 462-464.

12 Balasubramanian, T.N., Bindu Madhava Rao, R.S., Robinson, J.G. and Ravikumar, V. (1984). Selection of suitable intercrops to rainfed sorghum in vertisol. Madras Agriculture Journal. 71(12): 820-822.

13 Balasubramanian, T.N., Robinson, J.G. and Ravikumar, V. (1984). Study on intercropping of Leucaena leucocaphala with annual crops under dryland condition. Madras Agriculture Journal. 71(10): 677-680.

14 Balasubramanian, T.N., Robinson, J.G. and Ravikumar, V. (1984). Subabul as an intercrop in rainfed crops. Madras Agriculture Journal. 71(10): 677-680.

15 Balasubramanian, T.N., Robinson, J.G., Ravikumar, V. and Bindhu Madhavarao. (1984). Study on impact of intercropping in bajra. Madras Agriculture Journal. 71(11): 705

16 Jegadeesan, M., Kannathasan, J., Muthuvel, P. and Ravikumar, V. (1984). Effect of seed soaking on yield of rainfed sorghum. Madras Agriculture Journal. 71(3): 200-201.

17 Muthuvel, P., Subramanian, V., Robinson, J.G. and Ravikumar, V. (1984). Soil fertility and crop yield under bajra-pulses intercropping system. Madras Agriculture Journal. 71(9): 623-624.

18 Muthuvel, P., Subramanian, V., Robinson, J.G. and Ravikumar, V. (1984). Soil fertility and crop yield under sorghum-pulses intercropping system. Madras Agriculture Journal. 71(10): 656-658.

19 Muthuvel, P., Sivasamy, R., Subramanian, V. and Ravikumar, V. (1984). Effect of anti transpirants on soil moisture and yield of rainfed cotton. Madras Agriculture Journal 71(11): 735-737.

20 Balasubramanian, T.N., Robinson, J.G., Bindhu Madhava Rao and Ravikumar, V. (1985). Studies on performance of different species of cotton under dryland farming conditions. Madras Agriculture Journal. 12(1): 35-38.

21 Balasubramanian, T.N., Robinson, J.G., Sree Ramulu, K.S. and Iyen Perumal, S. (1986). Studies on population requirement for sorghum-based cowpea intercropping system under rainfed condition Madras Agriculture Journal. 73(4): 193-198.

22 Muthuswamy, P. Natesan, R. and Narayanan, A. (1986). Response of cowpea to application under rainfed condition. Madras Agriculture Journal. 73(5): 268-270.

23 Robinson, J.G. and Balasubramanian, T.N. and Ravikumar, V. (1986). Effect of different moisture conservation systems on the yield of sorghum (CSH 6) in rainfed vertisols. Madras Agriculture Journal. 73(5): 255-258

24 Muthvel, P., Rajkannu, K., Manickam, T.S. and Balasubramanian, T.L. (1986). Effect of P and Zn on the yield of sunflower. Oil Seeds Journal. 54: 22-23.

25 Rajaram, S., Selvaraj, K.V. and Subramanian, V. (1986). Optimum stage of harvest of cumbu (pearlmillet). Madras Agriculture Journal.73: 588.

26 Muthvel, P., Sivasamy, R., and Subramanian, V. (1987). Studies on nitrogen and phosphorus requirement of rainfed castor. Madras Agriculture Journal. 74(1): 26-28.

27 Muthvel, P., Sivasamy, R., Subramanian, V., Udayasoorian, C.and Sree Ramalu, U.S. (1988). Sorghum yield and nutrients uptake under varying levels of N in sorghum-blackgram intercropping system. Madras Agriculture Journal. 45(11-12): 405-408.

28 Muthuvel, P., Pallikondaperumal, R.K., Sivasamy, R., Subramanian, V. and Sree Ramulu, U.S. (1989). Soil fertility under continous cropping of cotton-pearlmillet in dryland vertisol. Madras Agriculture Journal. 76(4): 189-191.

29 Muthusankara Nayaranan, A., Chellamuthu, V., Rajamannar, A. and Sundersingh Rajapandia, J. (1989). Effect of herbicides on the weed control in rainfed cotton+ blackgram intercropping system. Indian Journal of weed sciences 20 (3): 91.

30 Balasubramanian, T.N., Ramamoorthy, K., Muthusankaranaryanan, A., Sree Ramulu, U.S. and Iyemperumal, S. (1989). Study on the selection of suitable pulse intercrops to rainfed maize in vertisol. The Madras Agriculture Journal. 76(B): 315-318.

31 Muthuvel, P., Pallikonda, R.K., Sivasamy, R., Subramanianm, V., and Sree Ramulu, U.S. (1989). Crop yield under a continuous cropping sequence. Madras Agriculture Journal. 76(6): 301-304.

32 Balasubramanian,T .N., Subramanian, S. (1990). Agronomic options for stabilized crop productivity in vertisols under rainfed conditions. Indian Journal of Dryland Agriculture Research and Development. 5 (1 and 2) 16-22.

33 Balasubramanian, T.N., Sree Ramulu, U.S. and Nalliah Devraj, S. (1992). Canopy management of Karunganni cotton under rainfed conditions. Madras Agriculture Journal. 79(9): 517-523.

34 Balasubramanian, T.N., and Subramani, S. (1993). Study on quality characters of rainfed cotton. The Madras Agriculture Journal. 80(11): 636-638.

35 Balasubramanian, T.N. and Subramanian, S. (1994). Correlation and multiple regression inter cropping system. Madras Agriculture Journal 81(3): 155-156.

36 Chidambaram, S. and Palanisamy, S. (1995). Variability and correlation studies of dry matter with reference to selection criteria in foxtail millet. Madras Agricultural Journal. 82(2): 1-3.

37 Chidambaram, S. and Palanisamy, S. (1995). Dry matter production and harvest index in relation to grain yield in Panivaragu-prosomillet. Madras Agricultural Journal. 82(1): 13-15.

38 Chidambaram, S. Ramanatha Pillai, O., Muthuawamy, P., Dhannakodi, C.V. and Sankarapandian, P. (1995). A high yielding drought tolerant blackgram for rainfed vertisols. Madras Agriculture Journal. 82(9,10): 517-519.

39 Muthuvel, P., Sivasamy, R. and Subramanian, V. (1995). Mitigating the adverse effect of drought in rainfed blackgram. Madras Agriculture Journal. 72(1): 22-24.

40 Sankarapandian, R. (1997). Cotton seed – its nutritive value and utilization as edible oil and protein. Bulletein Pure Applied Science. 16(B)(1): 21-24.

41 Sankarapandian, R. and Muppidathi, N. (1996). Genetic divergence in sunflower. Madras Agricultural Journal. 83(10): 637-639.

42 Sankarapandian, R., Krishnadoss, D. and Amrithadevarathinam, A. (1996). Genetlc parameters and correlatIon among yield and yield characters in grain sorghum. Madras Agricultural Journal. 83(10): 48-52

43 Sankarapandian, R. and Avudainayagam, S. (1996). Genetic variability, correlation and path analysis for jaggery yield related attributes in sweet sorghum. Madras Agricultural Journal. 83(10): 628-631.

44 Chitdeshwari, T., Sankaran, K. and Krishnadoss, D. (1997). Role of magnesium sulphate in controlling reddening of leaves in cotton. Madras Agricultural Journal. 84(7): 386-387

45 Chitdeshwari, T., Shaikdawood, M., Subramanian, V. and Krishnadoss, D. (1997). Effect of long-term manurial addition on the yield of crops and nutrient availability under rainfed vertisols. Madras Agricultural Journal. 84(7): 364-366.

46 Mohandas, S., Subramanian, V. and Appavu, K. (1997). Direct and residual effect of added levels of basic slag with green leaf manure on the availability and uptake of nutrients by rice. Madras Agricultural Journal. 84(IO): 609-614.

47 Muthuvel, P. Sivasamy, R., Subramanian, V., Uadayasoorian, C. and Sree Ramulu, U.S. (1998). Sorghum yield and nutrients uptake under varying levels of N in a sorghum-blackgram intercropping system. Madras Agriculture Journal 45(11-12): 405-408.

48 Sankarapandian, R. and krishnadoss, D. (1998). Genetic variability over environments and stability analysis of rainfed cotton. Cotton Improvement Journal, 10: 15-20.

49 Sankarapandian, R., Krishnadoss, D. and Subbaramanian. (1998). Heterosis in relation to combining ability components. A study from single and three-way cross hybrids of fodder sorghum. Karnataka Journal of Agricultural Science. 10(4): 1013-1018.

50 Sankarapandian, R., Krishnadoss, D. and Subbararmanian. N. (1999). Combining ability analysis for fodder and its component traits in sorghum under rainfed vertisol. Annals on Arid Zone, 3-S (2): 185-187

51 Sankarapandian, R., Rajarathinam and Muthusankara Narayanan, A. (1999) Phenotypic stability in kodo millet. Andhra Agricultural Journal, 46(3and4): 131-134.

52 Subramanian, S. and Chitdeshwari, T. (1999). Effect of longterm application of fertilizer and manures on yield of sorghum - cumbu in rotation on vertisol under dry-farming and soil properties. Journal of Indian Society of Soil Science, 47(2): 272-276.

53 Sankarapandian, R., Ramamurthy, R., Muthukrishnan, N. and Amirthadevarathinam, A. (1999). Evaluation of some high yielding sorghum genotype for resistance to sorghum midge, Journal of Insect Science, 8(1): 40-42.

54 Sankarapandian, R. (2000). Physiological, cooking and popping characteristics of some jowar varieties and there intercorrelation and regression analysis. Journal of food Science and Technology. 37(3): 337-339.

55 Sankarapandian, R. (2000). Stability of some quality characters in single and three-way cross hybrid of fodder sorghum (*Sorghum bicolor* (L) Moench). The Andhra Agriculture Journal. 47(1and2): 22-27.

56 Sankarapandiaan, R. (2000). Correlation and path analysis of quantity and quality traits of fodder sorghum hybrids and their parents. The Andhra Agriculture Journal. 47(3and4): 191-196.

57 Sankarapandian, R. (2000). Combining ability in single and three-way crosses for grain yield and its component trait in fodder sorghum. Bulletin of pure and applied sciences. 19(B) 2: 87-91.

58 Sankarapandian, R. and Krishnadoss, D. (2000). Recombinative heterosis and component analysis of grain yield attributes of single and three way crosses in fodder sorghum. Bioscience Research Bulletin. 16(1): 27-32.

59 Sankarapandian, R. (2000). Selection of two types of hybrid for fodder yield in sorghum (*Sorghum bicolor* (L) Moench). Bioscience Research Bulletin. 16(1): 19-22.

60 Manoharan, S., (2001). Sustainable integrated farming system for rice based ecosystem in Tambirabarani river basin. Bioscience Research Bulletin, Vol.17 No.2 (December) pp: 117-119.

61 Manoharan, S. (2001). Performances of sorghum as influenced by intercropping system under rainfed ecosystem. Bulletin of Pure and Applied Sciences. 20 (2) (July-December). *(Other details not available)*

62 Manoharan, S. (2001). Weed control methods on yield of sorghum based intercropping system under rainfed ecosystem. Bulletin of Pure and Applied Sciences, 21B (1): 49-50.

63 Manoharan, S. (2001). Integrated nutrient management in sorghum and cowpea intercropping system in rainfed vertisols of southern Tamil Nadu. Bioscience Research Bulletin. 17(2) (December): 113-115.

64 Manoharan, S. (2002). Performance of pulse crops in frontline demonstration in farmers field under rainfed condition.Bulletin of Pure and Applied Science. 21B(1): 47-48.

Phulbani

1 Satpathy, D., Nanda, A.K.. Sahoo, S. (1977). Preliminary observations on safflower grown under dryland conditions. Orissa University of Agricultural and Technology Journal of Research. 8: 112-114.

2 Mishra, C., Jena, D. (1979). Evaluation of nutrient deficiencies for wheat grown under dry and semi irrigated conditions based on the concept of yield targeting. Journal of Research. OUAT, 8: 99-107.

3 Satpathy, D and Nanda, A.K. (1980). Inter-relationship between yield and some plant characters in sorghum grown under rainfed conditions. Orissa University of Agriculutural and Technology Journal of Research. (*Other details not available*)

4 Mahapatra, P.K., Hati, N. and Satpathy, D . (1988). Response of pigeonpea and rice intercropping system to nitrogen fertilizer. Indian Pigeonpea News letter. 8: 8-9.

5 Senapati, P.C., Mahapatra, P.K. and Satpathy, D. (1988). Field performance of seeding devices in rainfed situation in Orissa, India. Agricultural Mechanization in Asia, Africa and Latin America. 19(1): 35-38

6 Mahapatra, P.K., Satpathy, D., Satpathy, P.C. and Kar, B.C. (1989). Effect of groundnut on pigeonpea intercropping system. Indian Journal of Agriculture Science. 59(8): 529-531.

7 Mahapatra, P.K. Satpthy, D. and Uttaray, S.K. (1989). Phosphorus fertilization of pigeonpea and rice intercropping. Indian Journal Agriculture Science. 59(11): 732-734.

8 Parida, D. and Dikshit, U.N. (1989). Breeding crops for intercropping systems - review. Orissa Journal of Agriculture Research. 2 (1): 1-9.

9 Senapati, P.C. and Satpathy, D. (1989). Testing of bullock drawn ploughs in lateritic soils. Agricultural mechanization in Asia, Africa and Latin America 20(3): 12-14.

10 Mahapatra, P.K., Satpathy, D., Dikshit, U.N. and Satpathy, S.C. (1989). Plant proportion studies in groundnut and pigeonpea intercropping system. Indian Journal of Dryland Agricultural Research and Development 4(1): 25-31.

11 Parida, D., Dikshit, U.N., Satpathy, D., and Mahapatra, P.K. (1989). Genotype compatibility study in pigeonpea + finger millet intercropping system. Indian Journal of Dryland Agricultural Research and Development. 4(1): 50-55.

12 Das, S.R., Mahapatra, P.K., Satpathy, D. and Uttaray, S.K. (1990). Studies in pigeonpea + groundnut intercropping system. Indian Journal of Agronomy. 36(1): 129-131.

13 Mahapatra, P.K., Satpathy, D., Dikshit, U. N. and Uttaray, S.K. (1990). Effect of row ratios in sesame (*Sesamum indicum*) and pigeonpea (*Cajanus cajan*) intercropping. Indian Journal of Agricultural Sciences. 60(6): 419-421.

14 Das, S.R., Mahapatra, P.K. and Uttaray, S.K. (1990). Effect of row ratio on energy relationship in groundnut (*Arachis hypogaea*) and pigeonpea (*Cajanus cajan*). Indian Journal of Agricultural Sciences. 60 (7): 479-481.

15 Mahapatra, P.K., Satpathy, D., Hati, N. and Senapati, P.C. (1990). Effect of nitrogen on pigeonpea (*Cajanus cajan*) and rice (*Oryza sativa*) intercropping system. Indian Journal of Agricultural Sciences. 60(8): 519-522.

16 Mahapatra, P.K. (1991). Weed control-intercropping systems based on pigeonpea (*Cajanus cajan*). Indian Journal of Agricultural Sciences 61(12): 885-888.

17 Dikshit, U.N. (1991). Field evaluation of drought tolerance in upland rice (*Oryza sativa* L.). Indian Journal of Dryland Agricultural Research and Development. 6 (1 and 2): 72-77.

18 Mahapatra, P.K., Dikshit, U.N., Pradhan, N.K. and Uttaray, S.K. (1991). Effect of phosphorus on pigeonpea (*Cajanus cajan*) and rice (*Oryza sativa*) intercropping. Indian Journal of Agricultural Sciences 61(5): 308-310.

19 Mahapatra, P.K., Senapati, P.C. and Satpathy, D. (1991). Energy studies in cropping systems in lateritic soils of Orissa, India. Agricultural Mechanization in Asia, Africa and Latin America, 22(1): 49-53.

20 Senapati, P.C., Mahapatra, P.K. and Dikshit, U.N. (1992). Field evaluation of seeding devices for finger millet. Agricultural Mechanization in Asia, Africa and Latin America. 23(3): 21-24.

21 Dash, M.K. and Senapati, P.C. (1992). Forecasting of dry and wet spells at Bhubaneswar for agricultural planning. Indian Journal of Soil Conservation. 20 (1and2): 75-82.

22 Dikshit, U.N., Satpathy, D. and Parida, D. (1995). Urmi – A new variety of horsegram**.** Indian Journal of Dryland Agricultural Research and Development. 10(1): 76-78.

23 Behera, B.D., Singh, G.S., Subudhi, C.R. and Pradhan, P.C. (1995). Effect of land treatment and cropping systems on productivity of undulating wasteland. Environment and Ecology. 13 (4): 984-985.

24 Subudhi, C.R. (1995). Rainfall analysis for Kalahandi district of Orissa. Environment and Ecology. 13 (4): 889- 892.

25 Subudhi, C.R. and Senapati, P.C. (1995). Effect of cropping systems on runoff, soil loss and crop productivity. Indian Journal of Soil Conservation. 23 (1): 82-83.

26 Behera, B.D. and Misra, C. (1995). Root zone water balances and yields of different cropping systems under unirrigated condition. Journal of Indian Society of Soil Science. 43 (3): 455-458.

27 Behera, B., Mishra, D., Alim, A., Singh, G.S. and Subudhi, C.R. (1996). Response of cotton (*Gossypium hirsutum*), cultivars to planting geometry -a short communication. Indian Journal of Dryland Agricultural Research and Development. 11 (3): 45-46.

28 Behera, B.D., Mishra, D., Singh, G.S., Mahapatra, P.K., Alim, A. and Senapati, P.C. (1996). Prospects of vegetable crops in pigeonpea based cropping systems in rainfed lateritic soils of Orissa. Indian Journal of Dryland Agricultural Research and Development. 11 (2): 66-68.

29 Pradhan, N.K. and Subudhi, C.R. (1996). Suitable intercropping systems mitigating drought in Kalahandi district, Orissa. Environment and Ecology. 14 (2): 485-486.

30 Rath, A., Jena, G.N. and Senapati, P.C. (1996). Forecasting of dry and wet spells at Boudh for Agricultural Planning. Indian Journal of Soil Conservation. 24 (1): 28-36.

31 Senapati, P.C., Dash, A.K. and Beura, R.N. (1996). Effect of vegetative bunding on runoff and soil loss in an alfisol. Indian Journal of Dryland Agricultural Research and Development. 11 (2): 97-99.

32 Subudhi, C.R., Pradhan, P.C. and Senapati, P.C. (1996). Effect of contour hedge row on runoff, soil loss and upland rice production. International Rice Research (21): 2 - 3.

33 Subudhi, C.R. (1996). Rainfall pattern for Kalahandi district of Orissa. Environment and Ecology. 14(1): 32-34

34 Subudhi, C.R. and Senapati, P.C. (1996). Runoff and soil loss under different vegetative measures in Kalahandi district of Orissa. Indian Journal of Soil Conservation. 24 (2): 177.

35 Subudhi, C.R., Pradhan. P.C. and Rahman, A. (1996). Implements for ploughing in north eastern coastal plains of Orissa. Environment and Ecology. 14 (1): 251-253.

36 Subudhi, C.R., Pradhan. P.C. and Senapati, P.C. (1996). Prediction of dry and wet spells at Phulbani for crop planning. Indian journal of Dryland Agriculture Research and Development. 11 (1): 5-9.

37 Subudhi, C.R., Pradhan. P.C., Behera, B., Senapati, P.C. and Singh, G.S. (1996). Rainfall characteristics at Phulbani. Indian Journal of Soil Conservation. 24 (1): 41-43.

38 Behera, B. and Singh, G.S. (1997). Weed management in runnerbean (*Phaseolus sp.*) under rainfed condition. Indian Journal of Weed Science. 29 (3 and 4): 202-204.

39 Behera, B.D., Singh, G.S. and Senapati, P.C. (1997). Biomass incorporation for boosting productivity, Phulbani plateau. Indian Journal of Dryland Agricultural Research and Development. 12 (1): 57-59.

40 Dash, S.K., Behera, B. Mishra, P.J. and Sahu, D. (1997). Evaluation of planting methods for in situ moisture conservation and establishment of forest trees in north eastern ghat zone of Orissa. Indian Journal of Soil Conservation. 25 (3): 253-255.

41 Mohanty, S.K., Behera. B. and Singh, R.S. (1997). Physiological association of weeds in turmeric in Kandhamal district of Orissa. Indian Journal of Weed Science. 29 (3 and 4): 142-146.

42 Rath, B., Pradhan, P.C., Behera, B. and Sahu, D. (1997). Efficacy of planting methods and establishment of Cassia, siamea in red lateritic soil belt of Orissa. Indian Journal of Forestry. 20 (2): 187-189.

43 Senapati, P.C. and Mahapatra, P.K. (1997). Response of a pigeonpea and rice intercropping system to tillage practices. Indian Journal of Soil Conservation. 25 (1): 88-89.

44 Subudhi, C.R., Pradhan, P.C., Behera, B. and Senapati, P.C. (1997). Frequency analysis of rainfall data for Phulbani, Orissa. Indian Journal of Dryland Agricultural Research and Development. 12 (1): 54-55.

45 Behera, B.D., Singh, G.S. and Senapati, P.C. (1998). New vistas for Olericulture in rainfed plateaus of Orissa. Indian Farming. 47 (12): 14-16.

46 Behera, B.D., Singh, G.S., Pradhan, P.C. and Senapati, P.C. (1998). Weed management in runnerbean (*Phaseolus sp.*) + maize (*Zea mays*) intercropping under rainfed conditions. Indian Journal of Agricultural Science. 68 (10): 697-698.

47 Behera, B.D., Singh, G.S., Pradhan, P.C. and Senapati, P.C. (1998). Effect of intercropping and residue incorporation on maize + cowpea- niger cropping system in Eastern Ghats. Indian Journal of Soil Conservation. 26 (2): 133-134.

48 Mishra, P.J., Behera, B. and Sahu, D. (1998). Efficacy of strip cropping in north-eastern ghat zone of Orissa. Indian Journal of Soil Conservation. 26 (3):284-2~4.

49 Mohanty, S.K. Baisakh, B. and Dikshit. U.N. (1998). Kalamung, a promising local mungbean cultivar. Environment and Ecology. 16 (1): 222-223.

50 Mohanty, SK., Baisakh, B. and Dikshit, U.N. (1998). Improvement of genetic architecture of a local cuitivar Kalamung of green gram by mutation. Legume Research. 21 (2) 125-127.

51 Subudhi, C.R. Pradhan, PC. And Senapati, P.C. (1998). Effect of vegetative barrier on soil erosion and yields of rice in Eastern Ghats. Indian Journal of Soil Conservation. 26 (2) .95-98.

52 Subudhi, C.R., Pradhan, P.C. and Senapati, P.C. (1998). Rainfall analysis of Ba!liguda, Kandhamai. Orissa. Indian Journal of Soil Conservation. 26 (2): 173-174.

53 Behera, B. Mohanty, S.K. and Singh, G.S. (1999). Weed flora of upland cereals in Kandhamal district of Orissa, Indian Journal of Weed Science. 31 (1 and 2): 1-7.

54 Behera, B., and Singh, G.S. (1999). Studies in weed management in monsoon season crop of tomato. Indian Journal of Weed Science. 31 (I and 2): 67-70.

55 Behera, B., Singh, G.S. and Senapati, P.C. (1999). Biological and economical feasibility of intercropping vegetable crops in rainfed pigeonpea in north-eastern ghat zone of Orissa. Indian Journal of Soil conservation. 27(3): 207-210.

56 Mishra, P.J., Dash, S.K., Behera, B. and Sahu, D. (1999). Evaluation of vegetative barriers for soil conservation and sustained land productivity. Indian Journal of Soil Conservation. 27 (2): 177-179.

57 Mishra, P.J. And Behera, B. (1999). Seasonal and situational impact on weedflora dynamics of mustard in alluvial soils of eastern Uttar Pradesh. Indian Journal of Weed Science. 31 (I and 2): 29-34.

58 Mohanty, S.K. and Baisakh, B. (1999). Phenotypic stability for yield and maturity in rice bean (*Vigna umbellata*) at rainfed condition. Environment and Ecology. 17 (I) 8-10

59 Mohanty, S. K. Baisakh, B. and Bhol, B.B. (1999). Phenotypic stability of seed yield and maturity in soybean (*Glycine max*). Indian Journal of Agricultural Sciences. 69 (12): .820-822.

60 Pradhan, P.C., Subudhi, C.R. and Senapati, P.C. (1999) Crop plans based on frequencies of dry and wet spells at Daringibadi block of Kandhamal district. Indian Journal of Agricultural Sciences. 69 (5): 345-349

61 Rath, J., Subudhi, C.R. and Senapati, P.C. (1999). Rainfall analysis of Kotagarh block of Kandhamal district, Orissa. Environment and Ecology. 17(1): 242-244.

62 Subudhi, C.R., Pradhan, P.C. and Senapati, P.C. (1999). Effect of vegetative barrier on soil erosion and yield of rice in eastern ghats. Indian Journal of Soil Conservation. 26 (2): 95-98.

63 Pradhan, P.C., Behera, B.D. and Senapati, P.C. (1999). Forecasting dry and wet spells in Ghumusar Udayagiri block of Orissa for strategies crop planning. Indian Journal of Dryland Agricultural Research and Development. 14(2): 68-76.

64 Subudhi. C.R., Pradhan, P.C. and Senapati, P.C. (2000). Effect of grass bunds on erosion loss and yield of rainfed rice. Orissa Engineering Congress Journal. 45: 136-140.

65 Jena, D., Pradhan, N.K., Pani, B.K. and Senapati, P.C. (2000). Long term effect of integrated nutrient management on properties of an alfisol and rice yield under dryland agriculture. Indian Journal of Dryland Agricultural Research and Development. 15(1): 37-41.

66 Subudhi, C.R., Pani, B.K., Mohanty, S.K., Senapati, H.K., Senapati, P.C. and Behera, B. (2000). Rainfall characteristics at Nuagaon of Kandhamal district, Orissa, India. Environment and Ecology. 18(4): 1033-1035.

67 Subudhi, C.R., Mohanty, S.K., Pani, B.K., Senapati, H.K., Senapati, P.C. and Behera, B. (2000). Rainfall pattern for Kandhamal district of Orissa, India. Environment and Ecology 18(4): 1039-1041.

68 Subudhi, C.R., Senapati, P.C., Senapati, H.K., Behera, B., Mohanty, S.K. and Pani, B.K. (2001). Rainfall characteristics of Khajuripada of Kandhamal district, Orissa, India. Journal of Research Orissa University of Agriculture and Technology. 19 (1,2): 15-18.

69 Senapati, H.K., Pani, B.K. and Senapati, P.C. (2001). Long term effects of manuring practices in an alfisol under rainfed condition of Orissa**.** Indian Journal of Dryland Agricultural Research and Development 16(2): 104-109.

70 Behera, B. and Senapati, P.C. (2001). Maize + cowpea- toria boosting tribal economy in eastern ghat of Orissa. Indian Farming. 51(9): 7-8.

71 Senapati, H.K., Pani, B.K., Subudhi, C.R. and Senapati, P.C. (2002). Productivity of rainfed rice – horsegram-cropping sequence as influenced by manuring practice in eastern ghat of Orissa. Indian Journal of Soil Conservation 30(1): 49-52.

Rajkot

1 Parmar, M.T. and Patel, A.S. (1975). Note on salt tolerance of bajra entries during germination. Gujarat Agricultural University Research Journal. 1(1): 87-88

2 Parmar, M.T. and Patel, L.J. (1975). Note on root development of bajra at different growth stages. Gujarat Agricultural University Research Journal. 1(1): 85-86.

3 Paida, V.J. and Parmar, M.T. (1979) .A note on effect of different levels of nitrogen and phosphorus on yield and yield attributes of castor GAUCH-1. Gujarat Agricultural University Research Journal. 5(2): 48-51

4 Parmar, M.T. and Patel, J.S. (1979). Note on root development of groundnut at different growth stages. Gujarat Agricultural University Research Journal. 5 (1): 44-45.

5 Khistaria, M.K., Patel, R.B. and Patel, J.C. (1980). Effect of different levels of nitrogen and phosphorus on yield of cotton. Indian Journal of Agronomy. 25(2): 315-317.

6 Parmar, M.T. and Buhecha, K.V. (1980). Response of Junagadh-11 groundnut to different levels and sources of phosphorus under rainfed conditions in medium black soils of Saurashtra.Gujarat Agricultural University Research Journal. 6(1): 8-12.

7 Patel, J.R., Parmar, M.T. and Patel, J.C. (1980). Effect of different sowing dates, spacings and plant population on yield of mustard. Indian Journal Agronomy. 25(3): 526-527.

8 Patel, K.A., Parmar, M.T. and Patel, J.C. (1980). Response of mustard to different spacings and levels of nitrogen and phosphorus. Indian Journal of Agronomy. 25(31): 524-525

9 Paida V. J. and Parmar, M.T. (1980). A note on effect of different levels of nitrogen and phosphorus on yield and yield attributes of castor GAUCH-1. Gujarat Agricultural University Research Journal. 5(2): 48-51.

10 Chuadhari, V.P., Makne, V.G. and Chopada, P.R. (1980). Diallel analysis in pigeonpea. Indian Journal of Agricultural Sciences. 50(5): 388-399.

11 Makne, V.G. and Chaudhari, V.P. (1980). Combining ability studies in safflower. Journal of Maharashtra Agriculture University. 5(2): 122-130.

12 Makne, V.G., Patel, V.D. and Chaudhari, V.P. (1980). Genetic variability and character association in safflower. Indian Journal of Agriculture Science. 49(10): 776-778.

13 Jain, M.L. and Shekhawat, P.S. (1980). Occurrence of downy mildew of cauliflower in Udaipur. Rajasthan. Indian Journal of Mycology and Plant Pathology 10(2): 29.

14 Bhalani, P.A. (1981) Effect of different types of food in the development of cotton jassid, Ambrasca bigntfulo (Ishidu). Gujarat Agricultural University Research Journal. 7(1): 45-46.

15 Akbari, K.N., Kanzaria, M.V. and Patel, M.S. (1981). Effect of phosphorus and lime application on phosphorus availability at varying periods and soil moisture conditions. Journal of Indian Society of Soil Science. 29: 193-98.

16 Monapara, B.A. (1981). Diallel analysis of forage yield and its components in sorghum. Madras Agriculture Journal. 68(5): 55-57

17 Parmar, M.T., Paida, V.J. and Sadaria, S.G. (1982). Note on response of pearlmillet HB-3 to different row spacing under dry farming conditions. Gujarat Agricultural University Research Journal. 8(1): 35-36.

18 Bagada, J.P. and Patel, J.C. (1983). Comparative yield potential of pearlmillet hybrids to varying levels of nitrogen. Indian Journal of Agronomy. 28(3): 309-310.

19 Bhaliya, P.J., Parmer, M.T. and Patel, J.C. (1983). Response of wheat to irrigation based on IW/PCE ratio under different nitrogen levels. Indian Journal of Agronomy. 28(3): 311-312.

20 Patel, A.L., Patel, R.B. and Patel, J.C. (1983). Response of summer groundnut varieties to sowing dates and levels of N and P. Indian Journal of Agronomy. 28(3): 307-308.

21 Patel, J.C. and Singh, R.M. (1983). Irrigation, mulch and cycocel effects on growth, yield, water use and nutrient uptake by sunflower *Helianthus annus* L. Oilseeds Journal 11: 1-4.

22 Patel, J.C. and Singh, R.M. (1983). Yield and nutrient uptake of sunflower as affected by irrigation, mulch and cycocel. Indian Journal of Agronomy 28(3): 205-210.

23 Rathod, B.M., Patel, J.C. and Malavia, D.D. (1983). Efficiency of herbicides in pearlmillet. Indian Journal of Weed Science. 15(2): 214-216.

24 Mayani, V.V. and Kumar, K. (1983). Small farmers and training stipend. Rural India 46(10): 10.

25 Akbari, K.N., Kanzaria, M.V. and Patel, M.S. (1983). Effect of phosphate on growth and its uptake by greengram under varying conditions of lime and moisture. Journal of Indian Society of Soil Science. 31: 162-163.

26 Gajera, M.S. and Patel, J.C. (1984). Response of summer groundnut to irrigation scheduling based on cumulative evaporation under varying fertilizer levels. Indian Journal of Agronomy. 29(3): 411-412.

27 Kachot, N.A., Patel, J.C. and Malavia, D.D. (1984). Response of summer groundnut to irrigation scheduling based on IW/CPE ratio under varying levels of nitrogen and phosphorus. Indian Journal of Agronomy. 29(3): 411-412.

28 Khataria, M.K., Patel, J.S., Parmar, M.T. and Patel, J.C. (1985). Pod distribution in bunch groundnut under rainfed conditions. Madras Agricultural Journal 72(8): 455-456.

29 Patel, J.S., Khistaria, M.K., Paida, V.J., Parmar, M.T. and Patel, J.C. (1985). Intercropping of pearlmillet and pigeonpea in rainfed conditions. Indian Journal of Agronomy 30(3): 383- 386.

30 Malavia, D.D. and Patel, R.R. (1986) Cropping strategies in relation to rainfall situation of north Gujarat agroclimatic zone. Seeds and Farms. 12(2): 33-36.

31 Patel, J.S., Khastarla, M.K., Paida, V.J., Parmar, M.T. and Patel, J.C. (1986). Response of rainfed groundnut to varying spacings. Indian Journal of Agronomy 30(4): 458-469.

32 Patel, R.R., Sonani, V.V. and Sasni, G.V. (1986). Effect of biological and inorganic fertilization on yield and yield attributes of greengram variety Gujarat.Gujarat Agricultural University Research Journal. (*Other details not available*)

33 Khastaria, M.K., Patel, J.S., Paida, V.J., Parmar, M.T. and Patel, J.C. (1986). Methods of scheduling life saving irrigation for rainfed groundnut. Gujarat Agricultural University Research Journal. 11(2): 17-20.

34 Malavia, D.D., Sayani, G.V., and Patel, R.R. (1986). Water use by some rainfed dryland crops in an inceptisol. Journal of Indian Society of Soil Science 34: 176-178.

35 Patel, R.R. and Vyas, Pandey. (1986). Water adequacy and crop production in Khed Brahma taluka of Sabarkantha district in Gujarat State.Gujarat Agricultural University Research Journal. 11(1): 25-29.

36 Akbari, K.N., Gandhi, A.P. and Patel, J.C. (1987). Response of rainfed cotton to nitrogen and phosphorus. Gujrat Agriculture University Research Journal. 13(1): 50-52.

37 Kapadia, M.N. and Puri, S.N. (1989). Seasonal incidence of natural enemies of *Bemisia tabaci* on cotton. Indian Journal of Ecology. 16(2): 164-168.

38 Kapadia, M.N. and Puri, S.N. (1990). Development, relative proportion and emergence of Encarsia transverna and Eretmocerus mundus important parasitold of *Bemisia tabaci*. Entomon. 15(3-4): 235-239.

39 Kapadia, M.N. and Puri, S.N. (1990). Feeding behaviour of Chrysoperia carnea on the parasitized pupae of Bemisia tabaci Entomon 15(3-4): 283-284.

40 Kelaya, V.V., Jethawa, M.G., Patel, J.C. and Sadaria, S.G. (1991). Effect of growth regulator and their spraying schedules on groundnut. Indian Journal of Agronomy 36(1): 111.

41 Patel, B.S., Barevadia, T.N., Patel, J.C. and Sadaria, S.G. (1991). Effect of FYM, N, P and K application on yield nutrient uptake by chicory. Indian Journal of Agronomy 36(2): 278-280.

42 Kapadia, M.N. and Puri, S.N. (1991). Parasitization of *Chrysoperia carnea* (Srophens) in cotton field under Parbhani conditions. Journal of Maharashtra Agriculture University. 16:453-454.

43 Kapadia, M.N. and Puri, S.N. (1991). Biology and comparative production efficacy of three heteropteron species recorded as predators of *Bemisia tabaci* in Maharashtra. Entomorphoga 36(4): 555-559.

44 Patel, V.N., Bharodia, R.K. and Mittal, V.P. (1991). Toxicity of some insecticides to the adults of ladybird beetle *Hippodamia varioata* (Goeze). Gujarat Agriculture University Research Journal. 16(2): 79-81.

45 Karle, A.S., Nankar, J.T., Solanke, A.V. and Khistaria, M.K. (1991). Percent contribution of plant parts in total dry matter accumulation of potato. Journal of Maharashtra Agriculture University. 16(3): 442.

46 Khistaria, M.K., Shelke, V.B. and Karle, A.S. (1991). Effect of nitrogen and jalshakti on yield of winter sorghum under rainfed and irrigated conditions. Indian Journal of Agronomy. 36: 83-85.

47 Dhuka, A.K., Sadaria, S.G., Patel, J.C. and Vyas, M.V. (1991). Response of irrigated late sown wheat to nitrogen application. Indian Journal Agronomy. 36(2): 276-277.

48 Patel, V.N., Bhalani, P.A. and Shekhawat, P.S. (1991). Insecticidal control schedule for sucking pests of rainfed groundnut. Indian Journal of Applied Entomology. 4: 9-14.

49 Gupta, H.C.L. and Patel, V.N. (1991). Effect of GA-3 on leaf curling of chillies. Pestology 16(11): 33.

50 Khistaria, M.K., Shelke, V.B. and Patel, M.P. (1992). Dry matter accumulation pattern and yield of *rabi* sorghum as affected by nitrogen, irrigation and jalshakti. PKV Research Journal 16(2): 171-174.

51 Patel, M.P., Shelke, V.B. and Khistaria, M.K. (1992). Persistence of herbicides applied to pre-monsoon groundnut and their effect on the succeeding crops. Journal of Maharashtra Agriculture University. 17(1): 160.

52 Kapadia, M.N. and Puri, S.N. (1992). Biology of sergangium parcesetosum as a predator of cotton whitefly. Journal of Maharashtra Agriculture University. 17: 162-163.

53 Kapadia, M.N. and Puri, S.N. (1992). Development of Chrysoperia carnea reared on aphids and whitefly. Journal of Maharashtra Agriculture University. 17: 163-164.

54 Kapadia, M.N. and Mittal, V.P. (1992). Influence of female and host age and lining of host exposure of the sex ratio of *Parasierola nephontidis* (Mueseback). GAU Research Journal. 18(1): 120-121.

55 Kapadia, M.N. (1992). Varietal susceptibility of castor to *Liriomyza trifolii* (Burgess). Indian Journal of Agriculture Entomology. 5: 79-81.

56 Kapadia, M.N. and Puri, S.N. (1993). whitefly *Bemisia tabaci* and parasitoid populations in insecticides treated cotton. Journal of Applied Zoology Research. 3: 7-10.

57 Kapadia, M.N. and Puri, S.N. (1993). Influence of host plants of *Bemisia tabaci* (Gennadious) as the development of parasitoids. Journal of Biological Control and Research. 5: 45-46.

58 Kapadia, M.N. and Puri, S.N. (1993). Toxicity of different insecticides against two parasitoids of *Bemisia tabaci* and their resistance against Eucarsia transvera. Indian Journal of Tropical Agriculture. 9: 81-84.

59 Kapadia, M.N. and Puri, S.N. (1993). Persistence of different insecticides on cotton leaves against larvae of chrysoperla carnea. Indian Journal of tropical Agriculture. 9: 85-87.

60 Kapadia, M.N. and Puri, S.N. (1993). Parasitism of whitefly on different host plants under green house conditions. Journal of Maharashtra Agriculture University. 18(2): 312-313.

61 Kapadia, M.N. and Puri, S.N. (1993). Parasitism of whitefly in relation to variety, plant protection and sowing date of cotton. Journal of Maharashtra Agriculture University. 18(2): 313.

62 Kapadia, M.N. and Puri, S.N. (1993). New records of natural enemies of castor whitefly, *Trialewrodes ricini* (Mishra). Journal of Maharashtra Agriculture University. 18(2): 339. (*Other details not available*)

63 Kapadia, M.N. and Mittal, V.P. (1993). Seasonal development of Goniozus nephantidis Muesobeek and its effectiveness against Opisina Wensalla Walker. Gujarat Agricultural University Research Journal. 19(1): 47-51.

64 Khistaria, M.K., Sadaria, S.G. and Gandhi, A.P. (1994). Intercropping in cotton (*Gossipium hirsutum* L.) under rainfed conditions. Gujarat Agricultural University Research Journal. 220(1): 9-14.

65 Khistaria, M.K., Patel, J.S., Paida, V.J. and Patel, J.C. (1994). Response of pearlmillet varieties to improved technology under rainfed conditions. Gujarat Agricultural University Research Journal. 20(1): 1-4.

66 Khistaria, M.K., Sadaria, S.G. and Paida, V.J. (1994). Performance of *rabi* crops under moisture stress conditions of Bhal tract. Gujarat Agricultural University Research Journal 20(1): 141-142.

67 Akbari, K.N., Karan, F. and Pandya, H.R. (1994). Available copper status in red loam soils of zone IV-A of Rajasthan in relation to certain soil characteristics. Agriculture Science Digest. 14(1): 23-26.

68 Khistaria, M.K., Patel, J.S., Paida, V.J. and Patel, J.C. (1994). Effect of different mulches on the yield of groundnut under rainfed conditions. Gujarat Agricultural University Research Journal. 20(1): 139-140.

69 Khistaria, M.K., Padmani, D.R., Patel, J.C. and Khokhani, M.G. (1995). Response of spreading groundnut to row spacing under rainfed condition. Gujarat Agricultural University Research Journal. 21(1): 154-156.

70 Khistaria, M.K. and Sadaria, S.G. (1995). Studies on pearlmillet mixed cropping with pulses under dry farming conditions. Journal of Maharashtra Agriculture University 20(1): 97-98.

71 Akabari, K.N., Fateh Karan and Pandya, H.R. (1995). Avaliable zinc status in red loam soils of zone IV-A of Rajasthan in relation to certain soil characteristics. Indian Journal of Soil Science. 43(1): 131-133. (*Other details not available*)

72 Domadia, J.M., Khistaria, M.K., Padmani, D.R. and Malavia, D.D. (1995). Evaluation of row ratio under intercropping in sesame with greengram. Gujarat Agricultural University Research Journal. 20(2): 149-150.

73 Hirpara, D.S., Sutaria, G.S., Akabari, K.N. and Kalaria, K.K. (1996). Nitrogen management for rainfed sorghum. Gujarat Agricultural University Research Journal . 22(1): 115-117. (*Other details not available*)

74 Khistaria, M.K., Khokhani, M.G., Vekaria, P.D., Akbari, K.N. and Yusufjai, A.S. (1996). Effect of intercropping of sesame with different row proportions on yield of groundnut. Journal of Maharashtra Agriculture University. 21(3): 47-49.

75 Sutaria, G.S., Patel, N.K., Akbari, K.N. and Patel, C.L. (1997). Rainfall, erosion index of annual and computational models for rainfed erosivity. Annals of Arid Zone. 36(4): 341-344.

76 Akbari, K.N, Sutaria, G.S., Hirpara, D.S. and Yusufjai, A.S. (1998). Response of groundnut to P fertilization with different tillage practices under rainfed agriculture. Indian Journal of Agriculture Research. 32(3): 171-175.

77 Sutaria, G.S., Hirpara, D.S., Akbari, K.N., Khokhani, M.N. and Yusufjai, A.S. (1998). Response of castor to nitrogen and phosphorus fertilization under dry farming condition. Indian Journal of Agriculture Research. 32(3): 185-189.

78 Hirpara, D.S., Patel, J.C., Akbari, K.N. and Sutaria, G.S. (1999). Response of sorghum to nitrogen and phosphorus fertilization on medium black soils. Indian Journal of Agriculture Research. 33(1): 57-61.

79 Akbari, K.N., Karan, F., Qureshi, F.M. and Pandya, H.R. (1999). Effect of micronutrients, sulphur and gypsum on yield of wheat and post harvest soil fertility in red loam soils of Mewar (Rajasthan). Indian Journal of Agriculture Research. 32(2): 80-86.

80 Sutaria, G.S., Hirpara, D.S., Akbari, K.N., Khokhani, M.N. and Yusufzai, A.S. (1999). Fertilizer management in sorghum CSH-5 under rainfed agriculture. Indian Journal of Agriculture Research. 33(2): 87-92.

81 Khistaria, M.K., Vadaria, K.N., Vekaria, P.D., Vadodaria, J.R. and Akbari, K.N. (1999). Fertilizer management in groundnut-pearlmillet (*Pennisetum glaucum*) cropping system under rainfed conditions. Indian Journal of Agronomy 43(4): 591-96.

82 Akbari, K.N., Sutaria, G.S., Hirpara, D.S. and Gandhi, A.P. (2000). Response of different fodder sorghum genotype to nitrogen in dryland conditions. Indian Journal of Agriculture Research. 34(3): 197-199.

83 Desai, D.T., Khistaria, M.K. and Akbari, K.N. (2001). Effect of N P fertilization and bio-fertilizer on yield, quality and nutrient uptake by cowpea. Advances in Plant Science. 14(11): 571-575.

84 Akbari, K.N., Sutaria, G.S., Hirpara, D.S. and Yusufzai, A.S. (2001). Response of soybean to N P fertilization on medium black soils under rainfed condition of Saurashtra. Legume Research. 24(1): 1-5.

85 Akbari, K.N., Sutaria, G.S., Patel, P.R. and Yusufzai, A.S. (2001). Response of castor (*Ricinus communis* L.) to nitrogen and phosphorus under rainfed condition. Advances in Plant Science. 14(11): 445-451.

86 Mehta, D.R., Kalola, A.D., Saradava, D.A. and Yusufzai, A.S. (2002). Rainfall variability analysis and its impact on crop productivity – a case study. Indian Journal of Agriculture Research. 36(1): 29-33.

87 Hirpara, D.S., Akbari, K.N. and Sutaria, G.S. (2002). Response of sorghum to N and P fertilization on vertic ustocrepts soils of Saurashtra. Advances in Plant Science. 15(1): 129-134.

Ranchi

1 Mohsin, M.A. Tiwari, S. and Ahmed, S. (1975). A hydraulic load cell Lysimeter. Research and Industry. 20: 76-79.

2 Alam, M.A., Tiwarai, S. and Yusuf. M. (1976). Development of deep furrow seeder. Research and Industry. 21 (1): 13-14.

3 Singh, R.K. Jha, K.K. and Rafey, A. (1977). Effect of dry vs normal and late sowing on the yield of some drilled rice cultivars in the rainfed upland of Chota Nagpur India. Journal of Agronomy. 22 (4): 227-230.

4 Mohsin, M.A. (1978). Choice of technology for tribal farmers. Journal of Society and Economic Studies. 6(1): 111-114

5 Singh, V.K., Alam, S.M. and Sinha, A.K. (1978) Investigation on the effect of different tillage machineries on physical properties of soil and yield of upland paddy. Journal of Soil and Water conservation In India. 28 (1and4): 1-4

6 Yadav, R.P., Mohsin, M.A. Singh, R.K. and Jha, K.K. (1978). Post monsoon application of straw mulch affecting soil moisture, soil temperature and yield of crop. Food Farming Agricullture. 9 (10): 327-331.

7 Rafey, A., Mittra, B.N. and Panday, H.K. (1978). Performance of ' Kalayan Sona' wheat under different soil moisture regimes at critical growth phases. Indian Journal of Agricultural Sciences. 48(12): 736-741.

8 Mohsin, M.A. (1979). A method of determining the position of wetfront in air entry permeameters. Research and Industry 24: 109-111.

9 Mohsin, M.A. and Singh, J. (1979). Air entry permeameter form insitu hydraulic conductivity measurements. Research and Industry. 24: (112-115)

10 Singh.R.K. and Rafey, A. (1979). Effect of sowing dates, seed rates and seeding depth on yield of wheat under dryland conditions. Ranchi Agriculture University Journal of Research. 3 (1): 43-46

11 Singh, R.K. and Rafey, A. (1979). Effect of post monsoon pre sowing mulching on population and yield of dryland wheat. Indian Journal of Soil Conservation. 7(2): 59-62.

12 Bhagat, A.K. Singh, R.K. and Srivastava, V.C. (1980). Evaluation of some lining method in irrigation channel. Indian Journal of Soil and Water Conservation. 11 b.

13 Haji, G.H., Acharya, R.C. and Mohsin, M.A. (1980). Probability of flood occurrence in river Jhalum of Kashmir Valley. Soils and Water Conservation in India. 29 (1-4).

14 Mohsin, M.A. and Mir. S.U. (1980) Influence of texture and organic carbon on available moisture of soil. Ranchi Agriculture University Journal of Research. 1-8.

15 Singh, R.K. and Prasad, R.B. (1980). Upland rice production. Indian farming. *(Other details not available)*

16 Singh, R.K. and Rafey, A. (1980). Effect of post monsoon pre sowing mulching on plant population and yield of dryland wheat. Indian Journal of Soil and Water Conservation 7(2): 59-62

17 Singh, R.K. and Rafey, A. (1980). Weed control technology for plateau region of Bihar. Journal of Soil and water conservation in India.

18 Singh, R.K., Rafey, A. and Jha K.K. (1980) Response of drilled rice cultivars to nitrogen under rainfed condition. Rajendra Agriculture University Journal of Research. 2(3-4): 1-3.

19 Singh, R.K., Rafey, A., Saha, G.P. and Jha K.K. (1980). Effect of phosphate levels and applications methods on grain yield of gram (*Cicer arietinium L*.) under dryland conditions. Rajendra Agriculture University Journal of Research. 2 (4).

20 Singh, V.K. and Sinha, A.K. (1980) Study of bullock drawn potato harvesting equipment. Journal of Indian Potato Association. 7(2): 102-106.

21 Verma, U.K., Singh, R.K., Rafey, A. and Srivastava, V.C. and Mukherjee, A.K. (1980). Place of mixed crops of arhar in cropping system of Bihar. Indian Journal of Genetics. 40 A.87-86.

22 Singh, R.K., Rafey, A. and Jha K.K. (1981). Effect of split application of nitrogen on the performance of upland rice. Indian Journal of Agronomy. 27(3): 194-205.

23 Singh, R.K., Rafey, A., Saha, G.P. and Jha. K.K. (1981). Influence of split application of nitrogen on the yield of upland rice. Oryza 18(2). *(Other details not available)*

24 Rafey, A., and Sahani, M.N. (1981). Effect of phosphatic and potassic fertilizers on the yield of the green berseem forage, dry matter and seed production. Ranchi Agricultural University Journal of Research. 2(2): 81-86.

25 Singh, R.K., Rafey, A. and Jha, K.K. (1981). Effect of sowing dates and seeding depths on the yield of wheat (Kalyana sona) under dryland condition. Ranchi Agricultural University Journal of Reseaarch. 3(1): 43-46.

26 Singh, R.K. and Rafey, A.and Jha, K.K. (1981). Response of drilled rice cultivars to nitrogen under rainfed condition. Ranchi Agricultural University Journal of Research. 2(3-4): 1-3.

27 Rahman, A., Singh Y.K., Rafey, A. and Singh R.K. (1982) Effect of intercropping of pluses, oilseeds and tuber crops in maize on yield and profit. Indian Journal of Agronomy 27(10): 1-8.

28 Singh, R.K., Rafey, A. and Rao, M.S.S. (1982) Effect of split application of nitrogen on the performance of upland rice. Indian journal of Agronomy 27(3). *(Other details not available)*

29 Rafey, A., Mittru, B.N. and Pande, H.K. (1983). Yield and milling quality of raw and parboiled rice of some promising new varieties. Indian Journal of Agronomy. 22(2): 118-122

30 Khan A.R. and Rafey, A. (1985). Effect of mulch harrowing on physical properties of soil and peanut seedling emergence. 3 Agronomy and Crop Science (Berlin and Hamburg): 155 (4): 227-231.

31 Ahmad, A., Rafey, A., Verma, U.K. and Singh, R.K. (1986). Response of groundnut varieties to different spacing. Indian Journal of Agronomy. 31(3): 248-251.

32 Rafey, A. Pasupalak, S.N. and Verma, U.K. (1986). Optimum time of sowing greengram and blackgram as intercrops of pigeonpea in the rainfed uplands of Bihar. Indian Journal of Agricutural Science. 56(2): 92-96

33 Rafey, A. and Verma, U.K. (1987). Effect of age of seedling and time of sowing in nursery on yield of transplanted ragi. Indian Journal of Agronomy. 32(3): 221-222.

34 Rafey, A. and Srivastava, V.C. (1988). Effect of cultivation, seeding rate and spacing of grain yield of rainfed fingermillet, Indian Journal of Agronomy. 33(3): 331-332.

35 Rafey, A. and Verma U.K. (1988) Dryland technology, its demonstrating pattern and training of Farmers. Seeds and Farms 16 (9-10): 25-28.

36 Rafey, A. and Verma, U.K. (1988). Production potential of legumes and cereals in intercropping system with pigeonpea (*Cajanus cajan*). *Indian* Journal of Agriculture Science. 58 (2): 433-446.

37 Rafey, A., Prasad, R.B. and Srivastava, V.C. (1988) Studies on seeding time of horsegram (*Mycrotyloma uniflorum* Lam Varde). Indian Journal of Agronomy. 33(3): 335-336.

38 Rafey, A., Tiwary, R.K.and Sriwastava, V.C. (1988) Effect of nitrogen and phosphorus on linseed. Indian Journal of Agronomy. 33 (3): 334-335.

39 Rafey, A., Ahmed, S. and Prasad, R.B. (1989). Studies on varying proportions of intercrops in redgram + groundnut intercropping system. Birsa Agriculture University Journal of Research 1(2): 149-152.

40 Rafey, A. and Srivastava, V.C. (1989). Effect of seed rate, spacing and fertilizer N and P on the growth and yield of latesown horse-gram (*Macrotyloma uniflorum).* Indian Journal of Agronomy. 34(4): 461-463.

41 Rafey, A., Khan P.A. and Srivastava, V.C. (1989) Effect of N levels on growth, yield and nutrient uptake of upland rice. Indian Journal of Agronomy. 34 (1): 133-135.

42 Rafey, A. and Singh, R.K. (1990) Effect of sowing, planting methods and levels of nitrogen on the yield of fingermillet (*Eleusin coracana)* in rainfed upland. Indian Journal of Dryland Agricultural Research and Development. 5 (1 and 2): 93-96.

43 Ahmad, S., Rafey, A. and Verma, U.K. (1991). Effect of earthing up on groundnut varieties, Birsa Agriculture University Journal of Research. 3(1): 81-82.

44 Rafey, A. and Ahmad, S. (1992). Management of fingermillet under rainfed conditions for higher yields. Journal of Research Birsa Agriculture University. 4(2): 133-135.

45 Rafey, A. and Das, N.C. (1991) Studies on the economics of N application to the response of maize in different cropping system. Economic Affairs, 36(4): 229-232.

46 Rafey, A. and Prasad, N.K. (1991) Biological potential and economic pulses with safflower (*Carthamus tinoctorius)* in dryland. Indian Journal of Agricultural Sciences. 61(12): 893-97.

47 Srivstava, V.C. Rafey, A. and Kalam, A. (1991). Response of direct seeded rainfed rice to different fertility levels on terraced land. Birsa Agriculture University Journal of Research 3(2): 183.

48 Rafey, A. (1992). Response of maize+legume intercropping system in nitrogen in rainfed upland. Indian Journal of Agricultural Sciences. 62(3): 210-12

49 Rafey, A. and Das, N.C. (1992). Studies on the economics of N application to the response of maize in different cropping system. Birsa Agriculture University Journal of Research 4(1): 47-49.

50 Rafey, A. and Prasad, N.K. (1992). Biological potential and economic feasibility of maize (*Zea mays*) + pigeonpea (*Cajanu cajan*) intercropping system in dryland. Indian Journal of Agricultural Sciences. 62(2): 110-113.

51 Rafey, A. Mittra, B.N. and Pande, H.K. (1992). Effect of micronutrients and grain moisture content at harvest of yield and milling quality of rice. Birsa Agriculture University of Research 4(1): 71-74.

52 Rafey, A., Prasad, R.B. and Singh, R.K. (1992). Optimum time for nursery seeding and spacings for rainfed fingermillet (*Eleusin coracana* Gaertn). Indian Journal of Agronomy. 37(4): 736-39.

53 Prasad, K. and Rafey, A. (1994). Chemical methods of weed management in lowland rice (*coryzasatra*). Indian Journal of Agricultural Science. 66(1): 73-74.

54 Prasad, K. and Rafey, A. (1995) Influence of weed and nitrogen management on weed growth, nutrient uptake and yield of wheat (*Triticum aestivam L*.). Indian Journal of Agricultural Sciences.65 (2): 117-122.

55 Prasad, K. and Rafey, A. (1995) Influence of weed control measures on weed growth, nutrient uptake and tuber yield of potato (*Solanum tuberosum L*.). Indian Journal of Agricultural Sciences 65(2): 45-48.

56 Prasad, K. and Rafey, A. (1995). Effect of integrated weed management on weed growth, nutrient uptakes, economics and energthcs in rainfed upland rice (*Oryza sativa*). Indian Journal of Agriculture Science. 65(4): 260-4.

57 Prasad, K. and Rafey, A. (1995). Effect of N and weed control on weeds, N uptake and crop productivity of wheat. Madras Agriculture Journal. 83(7): 430-32.

58 Prasad, K. and Rafey, A. (1995). Weed control in maize + soybean intercropping system under rainfed condition. Madras Agriculture Journal. 83(7): 443-45.

59 Prasad, K. and Qyamum, A. (1995). Weed control in cropping sequence based on single and mixed crops. Indian Journal of Agriculture Science. 65(8): 562-5

60 Rafey, A. (1995). Effect of nitrogen and phosphate on the growth and yield of horsegram (*Macrotyla uniflrum*) under rainfed condition. Birsa Agricultural University Journal of Research. 7(1): 15-16.

61 Rafey, A. and Prasad, K. (1995). Influence of weed control measures on weed growth, yield and yield attributes of rainfed groundnut (*Arachios hypogea*). Indian Journal of Agricultural Sciences. 65(1): 42-45.

62 Rafey, A. and Prasad, K. (1995). Influence of weed management practices in pigeonpea (*Cajanus cajan*) intercropped with upland rice (*Oryza sativa*). Indian Journal of Agricultural Sciences. 65(4): 281-2

63 Rafey, A. and Prasad, N.C. (1995). Biological and economic sustainability of crop geometry of pigeonpea (*Cajanus canjan L*.) + groundnut (*Arachis hypogea*) association. Indian Journal of Agricultural Sciences. 65(6): 428-30.

64 Prasad, K. and Rafey, A. (1995). Weed control in wheat+Indian mustard intercropping system, Madras Agricultural Journal. 87(7): 435-437.

65 Prasad, K. and Rafey, A. (1996) Direct and residual effects of phosphorus and potassium in rice - gram-cropping system. Birsa Agriculture University Journal of Research. 8(2): 111-114.

66 Rafey, A. and Prasad, N.K. (1996). Competition function and economic viability of intercropping of sorghum (*Sorghum bicolor*) and blackgram (*Vigna mungo*) in dryland. Indian Journal of Agronomy. 41(4): 22-25.

67 Prasad, K. and Rafey, A. (1996). Nutrient management in rice - gram cropping sequence. Birsa Agriculture University Journal of Research. 8(1): 15-16.

68 Prasad, K. and Rafey, A.(1999). Economic feasibility of pigeonpea based intercropping in Bihar plateau. Birsa Agriculture University Journal of Research.

69 Rafey, A. (2002). Agronomic management of fingermillet (*Eleusine coracana* L.*)* under rainfed condition. Birsa Agriculture University Journal of Research. 14(1): 77-78.

70 Rafey, A. and Singh, R.K. (2002). Effect of planting methods on yields of maize, soybean, and groundnut in the rainfed upland. Birsa Agriculture University Journal of Research. 14 (2). *(Other details not available)*

Rewa

1 Mishra, G.P. et al. (1988). Genetics of wheat and its components. Journal of Agriculture Research. (6): 183-188.

2 Mishra, G.P. et al. (1989). A leaf mutant in gram (*Cicer arietinum L*.) Current Science 58(7): 389-90.

3 Singh, R.P., Pandey, R.C. and Pandey, Ajay (1989). Rainfall characteristics for upland paddy cultivation in Kuthulia. Indian Journal Dryland Agriculture Research and Development. 5 (1 and 2): 82-89.

4 Baghel, M.S., Lal, J.P., Singh, P. and Kakran, M.S. (1990). Weed control studies in paddy-wheat. Science and Culture 56(7): 288-290

5 Khan, I. M. and Tiwari, K.L. (1990). Performance of rainfed upland rice in relation to drought. Indian Journal Dryland Agriculture Research and Development. 5 (1 and 2): 89-92.

6 Mishra, G.P. et al. (1990). Stability analysis in wheat. Mysore Journal of Agriculture Science. 24. (*Other details not available)*

7 Mishra, G.P., Yadav, S.P. and Mishra, D.K. (1990). Variability of characters in chickpea (*Cicer arietinum L*.) under drylands. Indian Journal of Dryland Agriculture Research and Development. 5: (1and2): 42-46.

8 Singh, R.P., Pandey, R.C. and Pandey, Ajay. (1990). A decade of water balance studies with special reference to paddy crop at agrometeorological laboratory, Kuthalia (Rewa) in Madhya Pradesh, India during monsoon season. Indian Journal of Dryland Agriculture Research and Development. 5 (1and2): 82-88.

9 Bajpai, A.K. and Sharma, N.K. (1991). Analysis of rainfall probability using Markov chain model for Kymore plateau. Indian Journal of Agricultural Engineering. (*Other details not available*)

10 Dwivedi, V.D., Pandey, Ajay. and Pandey, R.C. (1991). Studies on bund based farming. Madras Agriculture Journal.78: 9-12.

11 Mishra, G.P. et al. (1991). Combining ability for some quantitative characters in wheat. Journal of Agriculture Research. 6(1). *(Other details not available)*

12 Pandry, R.P., Dwivedi, V.D., Pandey, Ajay. and Sharma, P.P. (1991). Effect of nitrogen levels on the yield of jowar - arhar intercropping. Current Research. 20(8): 159.

13 Dwivedi, V.D., Pandey, R.P. and Namdeo, K.N. (1992). Weed control in pigeonpea - sorghum intercropping system. Indian Journal of Agronomy. 36(2): 234-38.

14 Dwivedi, V.D., Pandey, R.P. and Namdeo, K.N. (1992). Weed management in upland paddy (rice) sown with different methods. Indian Journal of Agronomy. 36 (Supplemental): 241-43

15 Pandey, R.C. Singh, R.P.; Sharma. P.P.; Pandey, R.P., Pandey, Ajay and Dwivedi, V.D. (1992). Effect of nitrogen and phosphorus fertilizers on sustainability of pigeonpea and sorghum system in sole and intercropping. Indian Pigeonpea Newsletter Feb.: 11-15.

16 Pandey, R.C.; Singh, P. Dwivedi, V.D. and Pandey, Ajay (1992). Effect of nitrogen and phosphorus on sustainability of wheat and chickpea intercropping system. Indian Chickpea Newsletter. 27 Dec.: 21-24.

17 Dwivedi, V.D. and Namdeo, K.N. (1993). Planting pattern in wheat-mustard intercropping under rainfed condition. Indian Journal of Agronomy. 37(4): 639-41.

18 Dwivedi, V.D. and Namdeo, K.N. (1993). Response of sesame (*Sesamum indicum* L.) to nitrogen and phosphorus. Indian Journal of Agronomy. 37(3): 606-607.

19 Kushwaha, H.S. et al. (1993). Stability performance of safflower genotypes. Indian Journal of Dryland Agricultural Research and Development. 8(1): 19-22.

20 Mishra, G.P. and Mishra, D.K. (1993). Stability of yield and its components in soybean (*Glycine max* (L) Merill). Indian Journal of Dryland Agriculture Research and Development. 8(1): 12-18.

21 Singh, R.P. and Singh, C.B. (1993). Genetic analysis in rainfed rice. Indian Journal of Dryland Agriculture Research and Development. 81: 40-46.

22 Dwivedi, V.D., Pandey, R.P, Namdeo, K.N. and Sharma, N.K. (1995). Response of linseed to nitrogen and phosphorus. Indian Journal of Agronomy 39(4): 695-697.

23 Mishra, G.P. and Mishra, D.K. (1995). Phenotypic stability for grain yield and its components in chickpea. Indian Journal of Dryland Agricultural Research and Development. 10(1): 20-25.

24 Dwivedi, V.D., Jain, N.K. and Namdeo, K.N. (1996). Intercropping system with upland rice (*Oryza sativa* L.). Indian Journal of Dryland Agricultural Research and Development. 11(1): 46-47.

25 Mishra, D.K. (1998). Association of various agronomic characters with yield in segregating population of rice (*O. sativa* L.) under different environments. Annals of Agriculture Research 19: 245-249.

26 Singh, A.K. et al (1998). Correlation and path analysis in early generation of hull less barley. Annals of Agriculture Research 19 (3): 260-264.

27 Singh, A.K. et al. (1998). Gene divergence in hull less barley. International Journal of Tropical Agriculture. 14(1-4): 213-217.

28 Singh, A.K. et al. (1998). Combining ability for grain yield and its attributing characters in rice (*O. sativa* L.) Annals of Agriculture Research 19(3): 254-259.

29 Mishra, D.K. (1999). Selection parameters in segregating population of rice under different environments. Oryza 26: 211-214.

30 Mishra, D.K. Mishra, G.P. and Baghel, M.S. (1999). Genotype environment interaction of yield and yield component in soybean. Annals of Agriculture Research 20: 56-57.

31 Perraju, P. and Sharma, N.P. (1999). Combining ability studies in rice. Oryza 36: 248-249.

32 Singh, A.K. et al (1999). Genetic analysis in hull less barley II Grain yield and its related characters. International Journal of Tropical Agriculture 17(1-4): 18-23.

Solapur

1 Chaudhari, P.N., Zope, R.E., Deokar, A.B. and Patil, N.Y. (1979). Heteorosis in sesame. Journal of Maharashtra Agricultural University. 4(1): 125- 126.

2 Bangar, A.R. (1979). Release of P from some organic manure in a calcareous soil. Journal of Maharashtra Agricultural University. 2(I): 60-61. (*Other details not available)*

3 Chaudhari, P. N., Zope, Z.E., Deokar, A.B. and Patil. N.Y. (1979). Inheritance of some qualitative characters in sesame. (*Sesamum indicum L*.) Journal of Maharashtra Agricultural University. 4(2): 137-139.

4 Deokar, A.B. and Patil, F.B. (1979). Heterosis in safflower. Indian Journal of Agricultural Sciences. 49(2): 82-86.

5 Narkhede, B.N., Deokar, A.B. and Cruz, R.D. (1979). Inheritance studies in *Dolichos lablab* (Roxb and L.). Journal of Maharashtra Agricultural University. 4(3): 262-265.

6 Patil, G.D., Deokar, A.B. and Patil, A.B. (1979). "Girija" A new variety of castor for Maharashtra. Journal on Maharashtra Agricultural University. 4(3): 281-284.

7 Deokar, A.B. and Patil, F.B. (1980). Combining ability analysis in Diallel cross of safflower. Journal of Maratwada Agricultural University. 5(3): 214-217.

8 Deokar, A.B. (1980). Linkage studies in pigeonpea. Journal of Maratwada Agricultural University. 5 (1) 53-55, 1980.

9 Deokar, A.B. (1980). Inheriance studies in pigeonpea. Journal of Maratwada Agricultural University. 5(1): 74-75.

10 Deokar, A.B. (1980). Inheritance of some character in across of pigeonpea (*Cajanus cajan* (L) Millsp). Journal of Maratwada Agricultural University. 5(1): 205-207.

11 Deokar, A.B. (1980). Response of safflower varieties to plant densities and nitrogen levels. Journal of Maratwada Agricultural University. 5 (1): 53-55.

12 Narkhede, B.N., Deokar, A.B. and Cruz, R.D. (1980). Linkage studies in pigeonpea. Journal of Maharashtra Agriculture University. 5(1): 80-89.

13 Patil, R.B. and Deokar, A.B. (1980). Inheritance studies in pigeonpea (*Cajanus cajan* (L) Millsp.). Journal on Maharashtra Agricultural University. 5(1): 74-75.

14 Magar, S.S., Patil, A.S., Surve, S.P. and Umrani, N.K. (1981). Minimization of soil moisture loss by introduction of wooden case in gravimetric method. Journal of Maharashtra Agricultural University. 6(3): 246-248.

15 Mane, V.S. and Umrani, N.K. (1981). Application of organic mulch at various stage of crop growth under dryland conditions. Indian Journal of Agronomy. 26(1): 1-6.

16 Patil, N.D., Koregave, B.A., Salunke, S.S., Narkhede, P.L., Walunjkar, R.B. and Bhanange, N.S. (1981). Dry sowing of rainfed crops according to rainfall probabilities. Journal on Maharashtra Agricultural University. 6(1): 1-3.

17 Salunke, S.S., Umrani, N.K. and Patil, N.D. (1981). Shifts in moisture regime (climatic) at Solapur. Journal of Maharashtra Agricultural University. 6(2): 171-172.

18 Singh, S.P., Patil, U.R., Umrani. N.K. and Upadhyay, U.P. (1981). Agronomic Research on grain sorghum -A review Silver Jubilee. Indian Agronomy.130-159.

19 Singh, S.P, Kale S.P. and Bhoi P.G. (1981). Studies on crop planning for drought prone area of Maharashtra. Journal of Maharashtra Agricultural University. 6(2): 110-113.

20 Umrani, N.K. and Bhoi, P.G. (1981). Response of hybrid Bajra HB-3 to nitrogen and P_2O_5 under dryland conditions. Journal of Maharashtra Agricultural University. 6(2): 123-125.

21 Umrani, N.K., Kale, S.P.and Bhoi, P.G. (1981). Studies on crop planning for drought prone area of Maharashtra. Journal of Maharashtra Agricultural University. 6(2): 110-113.

22 Umrani, N.K., Kale, S.P. and Bhoi, B.G. (1981). Response of safflower to application of nitrogen under rainfed conditions. Indian Journal of Agronomy. 26(4): 365-370.

23 Umrani, N.K. and Bhoi, P.G. (1982). Response of *Setaria italica* to N and P under two rainfall situations. Indian Journal of Agronom.y 27(1): 61-63.

24 Deokar, A.B., Bharud. R.W. and Umrani, N.K. (1983). Screening of mothbean genotypes for yellow mosaic disease resistance and yield. Journal of Maharashtra Agricultural University. (2): 198-199.

25 Deokar, A.B., Umrani, N.K., Bharud, R.W. and Jadhav, P.B. (1983). Preliminary studies on root development in safflower. Journal of Maharashtra Agricultural University. 8(2): 196.

26 Umrani, N.K., Daftardar, S.Y., Patil, C.B. and Walunjkar, R.B. (1983). Effect of inter row spacing, plant density and nitrogen application on pearlmillet BJ-104 under scanty rainfall conditions. Annals of Arid Zone. 22(2): 173.

27 Umrani, N.K. and Patil, N.D. (1983). Advances in fertilizer management for rainfed sorghum. Fertilizer News. 28(1): 57-61.

28 Bangar, A.R. (1984). A quick procedure for correlation of P soil tests with plant response. Indian Society of Soil Science. 32(4): 761-62.

29 Koregave, B.A., Demmanu, A.N. (1984). Substitution of wheat by safflower under rainfed conditions at Nipha in western tract of Maharashtra. Oilseeds Journal. 9 (1 to 4): 45 - 46.

30 Narkhede, P.L., Urnrani, N.K. Ghugare, R.V. (1984). Organic recycling of subabul for winter sorghum cultivated on dryland Indian Journal on Agricultural Science. 54: 251-256.

31 Umrani, N.K. and Patil, C.B. (1984). Fertilizer use efficiency in relation with management in drylands. Fertilizer News. 28(4): 33-34.

32 Umrani, N.K., Deokar, A.B. and Nimbalkar, V.S. (1984). Efficient use of fertilizer in drylands. Indian Farming. 8:7.

33 Salunke, S.S. and Umrani, N.K. (1986). Micrometerological studies in *rabi* sorghum. Journal of Maharashtra Agricultural University. 11(1): 114-115.

34 Gaur, S.L., Bangar, A.R. and Kadam, S.K. (1987). Effect of growth regulators with different levels of P on the yield and oil content in safflower. Current Research Reporter Mahatma Phule Krishi Vishwa Vidyalya. 3(1): 75-76. (*Other details not available*)

35 Gaur, S.L., Bangar, A.R. and Kadam, S.K. (1987). Effect of graded doses of N, P and K on the yield and oil content of sunflower. Current Research Reporter Mahatma Phule Krishi Vishwa Vidyalya. 3(1): 77-78. (*Other details not available*)

36 Kale, S.P., Narkhede, P.L. and Patil, A.J. (1987). Moisture relation characteristics of black clay soils under disturbed and undisturbed conditions. Current Research Reporter Mahatma Phule Krishi Vishwa Vidyalya. 3(1): 85-87.

37 Jadhav, A.S., Washnik, D.D. and Aikwad, C.B. (1989). Effect of irrigation levels on yield of summer groundnut. Journal of Maharashtra Agricultural University. 14(2): 151-152.

38 Kulkarni, S.D. (1989). Management of dryland watershed for optimum soil conservation and forage production. Indian Journal on Dryland Agricultural Research and Development. 4: 35-40.

39 Banger, K.C., Singh, R., Sangwan, P.S. and Laura, R.D. (1989). Part II. Effect of P application on concentration and uptake of nutrients. International Journal of Tropical Agriculture. 7: 300-309.

40 Banger, K.C., Singh, R., Sangwan, P.S. and Laura, R.D. (1989). Studies on the P-fertilization of SO4 – dominated and Cl dominated saline soils. Part I. Evaluation of different extractants: Critical limits and optimum doses for P-availability. International Journal of Tropical Agriculture. 7: 289-299.

41 Jadhav, A.S., Munde, M.S. and Gaikwad, C.B., (1990). Influence of sowing dates on of summer groundnut. Journal Maharashtra Agricultural University. 15(2): 214-217.

42 Umrani, N.K., Gaikwad, C.B. and Gare, B.N. (1992). Sustainability of cropping systems under dryland conditions of vertisol. Indian Journal of Agronomy. 37(4): 645-649.

43 Gaikwad, C.B., Patil, A.J. and Gare, B.N. (1993). Nitrogen use efficiency for *rabi* sorghum through legume –sorghum sequence. Journal of Maharashtra Agricultural University. 18(3): 476-477.

44 Jadhav, J.D., Patil, C.B., Gaikwad.C.B., Okashiand, D.D., Patil, J.D. (1993). Radiation use efficiency in dryland winter sorghum at different sowing periods. Indian Journal of Agricultural Science. 63(12): 842-843.

45 More, S.M., Deshpande, S.S., Malik, S.P. and Patil, J.D. (1993). Sericulture. A gainful vocation in dryland watershed. Indian Farming. 43(a) 9-10.

46 Shinde, S.K., Gaikwad, C.B. and Patil, J.D. (1993). Optimum sowing time for horsegram varieties. Indian Journal of Agronomy. 38(3): 436-438.

47 Bhore, A.V., Kadam, S.B., Gaikwad, C.B., Patil, J.D and Kale, S.P. (1994). Intercropping of linseed with chickpea under dryland conditions of Maharashtra. Journal of Maharashtra Agricultural University. 19(2): 223-225.

48 Bhore, A.V., Kadam, S.B., Gaikwad, C.B., Patil, J.D. and Kale, S.P. (1994). Double cropping of kharif fodder crops with safflower/ chickpea under dryland conditions of Maharashtra. Journal of Maharashtra Agricultural University. 19(2): 318-319.

49 Gaikwad, C.B., Gare, B.N. and Kale, S.P. (1994). Effects of sowing time based on the weekly rainfall probabilities on growth and yield of sunflower. Journal of Maharashtra Agricultural University. 19(1): 86-88.

50 Gaikwad, C.B., Patil, A.J., Kale, S.F. and Umrani, N.K. (1994). Effect of crop rotation on soil fertility status and pest built up in *rabi* crops. Journal of Maharashtra Agricultural University. 19(1): 16-18.

51 Jadhav, J.D., Mokashi, D.D., Shewale, M.R., Gaikwad, C.B. and Patil, J.D. (1994). Thermal requirement of pearlmillet under three dates of sowing. Annals of Arid zones. 33(4): 299-30.

52 Kadam, S.B., Bhore, A.V., Gaikwad, C.B., Patil, J.D. and Kale, S.B. (1994). Performance of different intercropping systems under varied rainfall situations of scarcity zone of Maharashtra. Journal of Maharashtra Agricultural University. 19(2): 316-318.

53 Jadhav, J.D., Patil, C.B., Shewale, M.R. and Patil, J.D. (1994). Heat energy utilization by different dryland winter sorghum cultivars in semi arid tracts Maharashtra. Madras Agricultural Journal. 82(7): 603-604.

54 Gaikwad. C.B., Patil, A.J., Patil, J.D., Chavan, S.B. and Sonawane, S.S. (1995). Performance of legume-sorghum (*Sorghum bicolor*) cropping sequence in vertisols. Indian Journal of Agronomy. 40(3): 375-379.

55 Jadhav, J.D., Durgade, A.B., Shewale, M.R., Patil, J.D., Gaikwad, C.B. and Mokashi, D.D. (1995). Heat unit efficiency in dryland winter sorghum (*Sorghum bicolor)* genotypes at different soil depths. Indian Journal of Agricultural Sciences. 65(7): 533-535.

56 Jadhav, J.D., Shewale, M.R., Mokashi, D.D., Gaikwad, C.B. and Patil, J.D. (1995). Radiation use efficiency in sole and intercropping system. Indian Journal of Agricultural Sciences. 65(7): 533-535.

57 Gaikwad, C.B., Patil, G.D., Shewale, M.R., Jadhav, J.D., Mokashi, D.D. and Chavan S.B. (1996). Agroclimatology of Solapur – a case study. Journal of Maharashtra Agricultural Universities. 21(1): 116-119.

58 Gaikwad, C.B., Patil, G.D., Shewale, M.R., Jadhav, J.D., Mokashi, D.D. and Chavan S.B. (1996). Rainfall variability analysis – a case study of Solapur, Journal of Maharashtra Agricultural University. 21(3): (*Other details not available*)

59 Gaikwad, C.B., Patil. J.D., Gare. B.N. Jadhav, J.D. and Shewale, M.R. (1996). Thermal requiremement of crops and cropping system sown according to rainfall probabilities. Madras Agriculture Journal. 83(8): 491-493.

60 Mokashi, D.D., Gaikwad, C.B., Patil, J.D., Shewale, M.R. and Jadhav, J.D. (1996). Contingent crop planning for aberrant weather situation. Journal of Maharashtra Agricultural University. 21(1): 172-173.

61 Mokashi, D.D., Gaikwad, C.B., Patil, J.D., Shewale, M.R. and Jadhav, J.D. (1996). Energy use efficiency of some contingent dryland crops. Journal of Maharashtra Agricultural University. 21(1): 171-172.

62 Mokashi, D.D., Jadhav, J.D., Shewale, M.R., Gaikwad, C.B. and Patil, J.D. (1996). Thermal requirement of winter sorghum under different dates of sowing. Indian Journal of Agriculture Science. 66(7): 426-428.

63 Patil, A.J., Gaikwad, C.B., Sonawane, S.S. and Patil, J.D. (1996). Response of *rabi* sorghum to application of P under dryland conditions. Journal of Maharashtra Agricultural University. 21: 49-52

64 Patil, G.D., Patil, A.J., Gaikwad, B.G. and Sonewane, S.S. (1996). Recycling of crop residue in soil and its effect on performance of *rabi* sorghum under dryland condition. Journal of Maharashtra Agricultural University. 21(2): 10-13.

65 Sonawane, S.S. Patil, A.J., Gaikwad, B.G. and Patil, J.D. (1996). Mineralization of nitrogen in soil mixed with sorghum residue, leucaena and glyricidia loppings. Journal of Maharashtra Agricultural University. 21(2): 123-124.

66 Naphade, K.T., Deshmukh, V.N., Guhe, Y.S., Rawatkar, S.S. (1996). An appraisal of the productivity potential of typic chromustert for sole crops. Journal of Maharashtra Agricultural University. 19(3): 326-28.

67 Jadhav, J.D., Shewale, M.R., Mokashi, D.D., Gaiwad, C.B. and Patil, J.D. (1997). Crop factor Kc values and actual evapotranspiration of chickpea from lysimeter studies. Indian Journal of Agricultural Science. 67(1): 33-35.

68 Mokashi, D.D., Jadhav, J.D., Shewale, M.R., Gaikwad, C.B. and Patil, J.D. (1997). Performance of crops and cropping systems under different dates of sowing. Indian Journal of Agronomy 42(2): 220-223.

69 Bangar, A.R. (1998). Fertilization of sorghum based cropping on modified Mitscherlich – Bray equation under SAT. Journal of Indian Society Soil Science. 46(3): 338-91.

70 Pawar, S.M., Danawale, N.J. and Khade, K. (1999). Selection of sugarcane varieties better ratoon productivity. Journal of Maharashtra Agriculture University. 22(1): 34-35.

71 Patil, J.D. and Deshpande, A.N. (2001). Integrated nutrient management in *rabi* sorghum under dryland conditions. Journal of Maharashtra Agricultural University. 24(1): 21-27.

72 Deshpande, A.N., Pawar, R.B. and Kale, S.P. (2001). Effect of different crop sequence on physical properties of inceptisols under dryland conditions. Journal of Soils and Crops. 10(i): 46 – 49.

73 Deshpande, A.N. (2002). Modification of yield targeting equation for fertilization of rainfed sorghum under semi-arid tracts. Journal of Maharashtra Agricultural University. 25(2).

Varanasi

1 Ghosh, B.C., Singh, H.B., Sharma, H.C. and Singh, M. (1975). Effect of time of weed removal on the performance of upland rice (Ratna) under rainfed conditions of Varanasi. Indian Journal of Weed Science. 7(1): 42-48.

2 Singh, H.B., Singh, R.A. and Singh, M. (1975). Note on chemical methods of weed control in wheat under dryland conditions of eastern U.P. Indian Journal of Weed Science. 7(1): 69.

3 Singh, M., Singh, V.P. and Sharma, H.C. (1975). Performance of certain barley varieties under rainfed conditions. Indian Journal of Agronomy. 20 (3): 248-50.

4 Singh, R.A.and Singh, U.N. (1975). Response of *rabi* cereal to levels and methods of nitrogen under dryland conditions of Eastern U.P. Annals of Agricultural Research. 14(2): 159-68

5 Singh, S.R. (1975). Water distribution pattern from rotating sprinkler. Journal of Agriculture Engineering. XVI(1). *(Other details not available)*

6 Singh, O.P. and Singh, R.A. (1976). Effect of phosphorus and potash on yield, nutrient uptake and moisture use pattern of rainfed wheat. Journal of Scientific Research Banaras Hindu University. 26(1): 61-68.

7 Singh, R.A., Singh, O.P. and Singh, M. (1976). Effect of soil compaction and nitrogen placement on weed population, yield and moisture use pattern of rainfed wheat. Plant and Soil. 44(1): 87-97.

8 Singh, S.R. (1976). Wind and pressure simulation in rotating sprinklers. Journal of Agriculture Engineering. Vol. XVI, No.1.

9 Singh, S.R. Singh, U.N., Singh, Y., Sharma, H.C. and Singh, M. (1976). Yield and moisture use pattern of rainfed barley and gram as influenced by methods of fertilizer placement. Journal of Scientific Research Banaras Hindu University. 26(2): 29-34.

10 Singh, S.R., Singh, O.P., Singh, Y., Sharma, H.C. and Singh, M. (1976). Mechanical weeding in direct sown rice. Indian Journal of Agricultural Sciences. 46(II): 507-509.

11 Singh, U.N., Singh, O.P. and Singh, R.A. (1976). Performance of different kharif crops and their varieties under dryland conditions of eastern U.P. Journal of Scientific Research Banaras Hindu University. 26(1): 50-54.

12 Singh, V.P. Sharma, H.C. and Singh, M. (1976). Varietal performance of safflower under rainfed conditions of eastern U.P. Indian Journal of Agronomy. 26(4): 475

13 Singh, V.P., Sharma, H.C. and Singh, M. (1976). Varietal performance of gram under rainfed conditions of Varanasi region. Indian Journal of Agronomy. 21(4): 374

14 Ghosh, B.C., Sharma, H.C. and Singh, M. (1977). Methods and time of weed control in upland rice. Indian Journal of Weed Science. 9(1): 33-36.

15 Sharma, H.C., Singh, H.B. and Friesen, G.H. (1977). Competition from weeds and their control in direct seeded rice. Weed Research. 17: 103-108.

16 Singh, R.A., Singh, O.P., Sharma, H.C. and Singh, M. (1977). Effect of levels of nitrogen and phosphorus on yield, oil content and moisture use pattern of rainfed winter sunflower. Indian Journal of Agricultural Sciences. 47(2): 96-99.

17 Singh, R.A., Singh, O.P., Sharma, H.C. and Singh, M. (1977). Yield and moisture pattern of *rabi* crops grown under rainfed conditions of eastern U.P. Annals of Arid Zone. 16(1): 61-66.

18 Singh, O.P., Singh, R.A. and Singh, M. (1978). Effect of compaction and nitrogen placement on yield and nitrogen uptake by rainfed rice and wheat. Annals of Arid Zone. 17(2): 123-13

19 Singh, R.A. and Singh, S.R. (1978). Effect of nitrogen and phosphorus on yield, quality and moisture use pattern of linseed grown on rainfed lands. Indian Journal of Agricultural Sciences. 48(1): 583-588.

20 Singh, R.A. and Singh, U.N. (1978). Effect of nitrogen application on yield, nitrogen uptake and moisture use pattern of rainfed barley. Agriculture Research and Rural Development. 1: 29-34.

21 Singh, S.R., Sharma, H.C. and Singh, M. (1978). Role of farm machineries in dryland agriculture. Journal of Agriculture Research and Rural Development. 1: 83-89.

22 Singh, S.R., Singh, O.P., Sharma, H.C., Singh, M. and Singh, Y. (1978). Note on the effects of preparatory tillage on soil moisture storage and yield of rainfed rice. Indian Journal of Agricultural Sciences. 48(5): 308-309.

23 Singh, U.N., Singh, S.R., Singh, R.A. and Singh, M. (1978). Protective irrigation for wheat under dryland conditions of eastern U .P. Journal of Scientific Research Banaras Hindu University. 26(1-2): 41-47.

24 Sharma, H.C. and Singh, U.N. (1979). Management of rainfed areas in Bihar, M.P, Orissa and U.P. Agriculture Research and Rural Development. 2: 83-101

25 Singh, S.R., Singh, U.N., Singh, Y., Sharma, H.C. and Singh, M. (1979). Weed control in direct sown rainfed rice. Agriculture Research and Rural development. 2: 1-6.

26 Singh, R.A. and Singh, U.N. (1979). Effect of levels and methods of nitrogen application on grain yield and nitrogen uptake by rainfed rice. Geobios 6: 145-149

27 Singh, R.A., Sharma, H.C., Singh, U.N. and Singh, M. (1979). Response of direct seeded rice to nitrogen under dryland condition. Indian Journal of Agronomy. 24(2): 161-163.

28 Singh, U.N. and Singh, R.A. (1979). Effect of nitrogen on yield of rainfed oats and its nitrogen uptake and moisture use. Indian Journal of Agriculture Science. 49(12): 945-949.

29 Upasani, R.K. and Sharma, H.C. (1980). Response of pearlmillet to nitrogen fertilization under rainfed condition. Indian Journal of Agronomy 25(4): 727-728.

30 Lal, J.P., Sharma, H.C. and Singh, M. (1981). Mutagenic effectiveness and efficiency of gamma rays and ethyl methane sulphonate in wheat, gram and lentil under dryland conditions of Varanasi. Agriculture Research and Rural Development 4: 45-47.

31 Singh, S.R. and Singh, M. (1983). Cropping system for increased and stabilized production from dryland of U.P. Journal of Agriculture Research and Rural development. 6:26-31.

32 Lal, J.P. and Singh, Mahatim. (1984). Phenotypic stability of different gram varieties under dryland conditions of Varanasi. Indian Journal of Agricultural Research and Rural Development 7: 97-99.

33 Singh, S.R., Singh, T.K. and Singh, Y. (1984). Effect of sowing dates on soil moisture availability under rainfed conditions. Agriculture Research and Rural Development. 7:27 - 29.

34 Singh, S.R., Singh, U.N. and Singh, T.K.. (1984). Weed competition and their control in upland rice. Journal of Weed Science. *(Other details not available)*

35 Singh, S.R., Singh, U.N., Singh and Mahatim (1984). Effect of time of weed removal on yield of blackgram under rainfed condition. Journal of Weed Science. *(Other details not available)*

36 Singh, S.R. and Singh, T.K. (1984). Effect of sowing dates on the performance of rainfed barley. Journal of Agriculture Research and Rural Development. 7: 21-26

37 Singh, K., Sharma, S.P., Singh, T.K. and Singh, Y. (1986). Effect of water logging on growth, yield and nutrient concentration of blackgram and greengram under subtropical conditions of Varanasi. Annals of Agriculture Research 7: 169-171.

38 Singh, K., Jamwal, J.S., Singh, T.K. and Singh, J.P. (1989). Effect of phosphorus and biofertilisers on growth parameters, nodulation and yield of blackgram. Annals of Agriculture Research 10(3): 249-52.

39 Singh, R.P., Singh, Y. and Singh, J.P. (1989). Intercropping barley with mustard different row ratios under dryland condition. Indian Journal of Dryland Agriculture Research and Development 4(2): 99-102.

40 Singh, R.P., Singh, J.P. and Singh, Y. (1989). Effect of varieties, row spacing and plant densities on growth and yield of mustard in dryland condition. Journal of Seed Research 6(2): 349-352.

41 Pandey, J., Singh, R.P. and Shukla, K. (1991). Studies on chemical weed control in upland rice. Indian Journal of Weed Science. 23(3 and 4): 7-9.

42 Lal, J.P. and Rai, B. (1991). Vistas in developing commercial varieties of sesamum oil crop. Indian farming August: 24-27.

43 Singh, R.P., Singh, M.P., Singh,Y. and Singh, V.P. (1992). Nitrogen management in rainfed low land rice -a review. Agriculture Reviews. 13(3): 119-128.

44 Sarkar, S., Singh, S.R. and Singh, R.P. (1994). Role of organic sources on yield and water use pattern of lentil. Journal of Soil Science. 24: 290-291.

45 Srivastava, S.C.and Lal, J.P. (1994). Effects of crop growth and soil treatments on microbial C, N and P in dry tropical arable land. Biology and Fertility of Soils. 17:108-114.

46 Sarkar, S. and Kar, S. (1995). Comparison between simulated and measured profile water distribution in rice. Agriculture Water Management, 27: 341

47 Sarkar, S. and Kar, S. (1995). Simulation of evapotranspiration from groundnut under wet and dry conditions. Agriculture Water Management 27: 299-307.

48 Singh, T.K., Bohra, J.S. and Singh, K. (1995). Effect of fertility and plant density of intercropped sesame on production potential of pigeonpea -sesame intercropping system. Journal of Oilseed Research 12(1): 42-46.

49 Singh, R.P., Singh, S.R. and Singh, T.K. (1977). Response of rainfed rice to foliar application of zinc and iron. Indian Journal of Dryland Agriculture Research and Development. 12(2): 109-111.

50 Singh, S.R., Singh, R.P. and Singh, Y. (1997). Influence of methods of fertilizer placement on performance of barley. Indian Journal of Dryland Agriculture Research and Development. 12(1): 60-61.

51 Ghosh, S., Singh, O.N. and Singh, R.P. (1998). Performance of some fresh bean (*Phaseolus vulgaris*) based intercropping systems. Legume Research 21 (3/4): 242-244

52 Singh, R.P and Singh, Yaswant (1998). Performance of rainfed Indian mustard (*Brassica juncea*) varieties at varying levels of nitrogen. Indian Journal of Agronomy. 43(4): 709-712.

53 Srivastava, S.C. and Lal, J.P. (1998). Nitrogen mineralization in variously treated dryland tropical arable soil. Journal of Indian Society of Soil Science. 46(1): 9-14.

54 Sarkar, S., Singh, S.K., Singh, S.R. and Singh, A.P. (1999). Influence of initial profile water status and nitrogen doses on yield and evapotranspiration rate of dryland barley. Journal of Indian Society of Soil Science.47: 22-28.

55 Mall, R.K., Gupta, B.R.D., Singh, K.K. and Singh, T.K. (2000). Phenology and yield of wheat (*Triticum aestivum*) in relation to growing degree-days and photo thermal unit. Indian Journal of Agriculture Science. 70(10): 647-652.

56 Srinivasulu, K., Singh, R.P. and Madhavi, K. (2000). Effect of pigeonpea (*Cajanus cajan*(L.) Mill sp.) based intercropping system on soil fertility status. Indian Journal of Environment and Ecoplasm.3 (1): 93-95.

57 Srinivasulu, K., Singh, R.P. and Madhavi, K. (2000). Performance of rainfed pigeonpea (*Cajanus cajan*) based intercropping systems under varying planting pattern. Crop Research. 20(1): 56-61.

58 Singh, Y., Singh, S.R. (2000). Effect of mulching on the performance of barley under dryland condition Indian Journal of Dryland Agriculture Research and Development. 15(2): 161-162.

59 Singh, Y., Singh, S.R., Singh, R.P., Singh ,T.K. (2000). Productivity of barley and Rajmash intercropping under varying row ratio and supplemental irrigation. Indian Journal of Dryland Agricultural Research and Development. 15(1): 78-79.

60 Singh, S.K., Varma, S.C. and Singh, R.P. (2001). Effect of integrated nutrient management on yield, nutrient uptake and changes in soil fertility under rice (*Oryza sativa*) lentil (*Lens culnaris*) cropping system. Indian Journal of Agronomy. 46(2): 191-197.

3. Important Recommendations

Important recommendations given to the state departments of agriculture and have become popular with the farmers from various centers are given production system-wise since inception till date. These recommendations are linked to the list of publications to the possible extent. The centers name is identified after the recommendations within paranthesis by first four letters of the center's name followed by the publication serial number.

Rainfed Rice based Production System (Ranchi)

Rainwater Management

The fields must be bunded to conserve soil moisture in uplands.

Crops and Cropping Systems

Rice

Sowing of upland rice should be completed by last week of June by line sowing behind the plough 35 cm apart with a seed rate of 6 to 8 kg/ha of Birsa Gora 102, Birsa Dhan 101(Ranc 5,15)

In medium and low lands where water will stagnate up to 15th November, transplant (rice IR 36, Kanak, or Pankaj) before third week of July, one month old seedlings with a spacing of 20 x 15 cm. For late transplanting 15 x 10 cm to compensate the yield reduction.

Crop substitution

Incase of upland, groundnut, maize and soybean must be substituted in place of rice and finger millet. Comparatively deeper and light textured uplands can support a good crop of groundnut, soybean, finger millet, maize, sorghum, minor millet, pigeonoea, blackgram, greengram, sweet potato,. sesame, niger, horsegram etc.,. Intercropping are benefical for these lands and recommended intercrops are:

Pigeonpea + Maize (Alternate rows 75 cm apart full population of both) (Ranc 21,27, 48, 49, 50, 68)

Pigeonpea +Rice (Two rows of rice in between 2 rows of pigeonpea spaced 75 cm) (Ranc 36, 65, 68, 70)

Pigeonpea + Groundnut (Three rows of groundnut in between 2 rows of pigeonpea space at 90 cm) (Ranc 63)

Pigeonpea + Blackgram/ Greengram (Two rows of black gram/Green gram in between 2 rows of pigeonpea at 75 cm) (Ranc 32)

Weeding

2-3 days after transplanting Butachlor @ 1.5 kg ai/ha must be sprayed to control the weeds. Weeding is critical within 3 to 4 weeks. After one month one hand weeding is essential.

Soil and Nutrient Management

In uplands FYM, compost as per availability and 40 N, 30 P_2O_5 and 20 K_20 kg/ha. (Ranc 22, 54)

In lowlands 2.5 t/ha FYM/compost, 50 P_2O_5 and 40 K_20 kg/ha basal. Equal splits of total 80 N kg/ha at the time of transplanting and after one month after weeding. After application of N water should not flow in to another field up to 3 to 4 days.

Alternate Land Use System

Social forestry, farm forestry and establishment of pasture crops in denuded, eroded, highly sloppy and shallow lands.

Rainfed Rice based Production System (Varanasi)

Rainwater Management

Land treatment

Tillage during summer

Open end contour or graded bunds (0.3 to 4%)

Drop structure at intervals across seasonal rivulets in Vindhyan tract with rolling abrupt/ dissected topography

Supplemental irrigation
Farm ponds/ storage bundhies in mild to flat toposequence of Gangetic plains and foot hills of Vindhyan range.

Wide diamater wells as additional minor irrigation source.

Supplementing irrigation utilizing harvested water

Rajmash + barley with 3 cm irrigation 30 days after sowing (Vara 60)

Crops and Cropping Systems

Crops
Chickpea replacing traditional wheat
Lentil mutant HUL 11 has been ranked first in multilocation trial conducted in North-East palin zone over recommended Pant L639 and Pant L 406

Cropping systems
Upland rice- chickpea /lentil for flat low lands (Vara 60,56,57)

Sesame-chickpea/ lentil in well drained medium/ uplands (Vara 48, 56, 57)

Intercropping blackgram (50% population) or sesame (75% population) with pigeonpea (100%population),

Barley+ mustard (8:1) (Varra 39)

Lentil + mustard (4:1).

Okra + Pigeonpea

Tomato + lentil or linseed

Plant protection

Sowing in time

First 30 days (after sowing) is most crucial for weed control in Kharif crops of dryland.

Pre-emergence application of Alachlor and post emergence application of proponil @ 2 kg/ha in upland rice (Vara 1,14, 34, 41)

Pre emergence application of atrazine @ 1-2 kg ai/ha in maize, pearlmillet and sorghum

Alternatively two inter culture operations 30-35 and 45-50 DAS

Soil and Nutrient Management

Inorganics
80:40:30 N - P_2O_5 - K_20 to cereals
20:40:20 N - P_2O_5 - K_20 to pulses
40:20:20 N - P_2O_5 - K_20 to oilseeds

Integration

Pulse component in the system

Conjunctive use of nutrients through organic (40 kg N/ha) and inorganic (40 kg N/ha) fertilizers in rice – lentil (sustainablity index 0:70) (Vara 44)

Alternate Land Use System

Agro-horti system
Pigeonpea + field pea in guava
Ber+ wheat

Implements

Seed drills
Bullock drawn multi crop seeder
Malviya machine

Others
Multi farming unit for operations like seed bed preparation, seeding and weeding
Dryland weeders

Rainfed Rice based Production System (Faizabad)

Rainwater Management

Summer tillage

Deep ploughing during summer followed by two cultivators
Seeding time
Preparation of seedbed by two ploughings
Two planking at the time of sowing of sorghum was proved more remunerative.

Crops and Cropping Systems

Cultivars

Rice (variety NDR-312)
Groundnut (variety Chandra)
Pigeonpea (variety Bahar)
Groundnut and pigeonpea proved more remunerative than paddy, blackgram, sunflower, greengram, sorghum, maize, pearlmillet and sesamum crops.
Mustard (RSM-106, Varuna and NDR-8501) 9Faiz 21)
Chickpea (Type-3)
Lentil (HUL-11)

Intercropping

Mustard + chickpea (1:4)
Gram and mustard crops gave higher yields when sown after the early sown blackgram. (Faiz 8,6)
Barley produced more yield when sown after the early sown fodder crops of maize + cowpea.
Pigeonpea + groundnut or blackgram (Faiz 8,6)

Sequence cropping

Rice – chickpea (NDG-8605)

Soil and Nutrient Management

Inorganics

Mustard +Chickpea (1:4 and 1:3) with recommended dose of fertilizer i.e., 60kg N+ 30Kg P_2O_5/ha to mustard and 18kg N+46 P_2O_5/ha to chickpea (Faiz 8,11)
Maize varieties like Sartaj and Naveen grown on grade bund or ridge furrow with 100:50:50 N P_2O_5 K_2O kg/ha
Rice 80 kg N/ha
Linseed (Garima and Mukta) with 30kg N/ha (Faiz 1)
Lentil 30kg P_2O_5 and 15kg S/ha. (Faiz 2)
Mustard 60kg N and 40kg S/ha (Faiz 3, 16)
Sorghum 30 N 40 P_2O_5 30 K_2O kg/ha 50% at sowing and 30 N kg/ha at 40 days
Chickpea 60 P_2O_5 and 25 Zn kg/ha

Alternate Land Use System

Implements

Land preparation and sowing of seed and application of fertilizer by power tiller operated till plant machine.

Rainfed Rice based Production System (Phulbani)

Rainwater Management

Crops and Cropping Systems

Intercropping system of pigeonpea + groundnut, pigeonpea + rice, pigeonpea+ greengram, maize + cowpea and pigeonpea + ragi. (Phul 4, 6, 7 10,11,12,14,15,16,18, 28, 29,43,47,55, 70)
Replacement of long duration local rice varieties by short duration high yielding varieties like Subhadra, ZHO-11-26 and BAU 146-16-3 for rainfed uplands.

Practice of short duration high yielding rice variety/ maize in Kharif followed by short duration high yielding variety of mustard/ Horsegram as sequence crop to enable the farmers to take two crops under rainfed situation. (Phul 22,71)

Recommendations of management practices like early sowing before the onset of monsoon or just after, line sowing by suitable implements, timely weeding, seed treatment and maintenance of optimum plant population.

Soil and Nutrient Management	Application of lime in acid soil to improve the productivity of pulse and oilseed crops as well as maize crop. Split application of Nitrogenous fertilizers to Kharif crops to improve the fertilizer use efficiency.
Alternate Land Use System	

Groundnut based Production System (Anantapur)

Rainwater Management	Contour bunding of 0.63 m^2 cross section at 50 m interval Deep ploughing once in three years (Anan 14) Dead furrow at 3 to 6 mm interval (Anan 5, 10)
Crops and Cropping Systems	**Varieties** Groundnut - Verma, K-4 JL-24 Pigeonpea - LRG 30 Pearlmillet – Ananta (APS 1) Sorghum - Taapijonna (AJ-140) Foxtail millet - Lepakshi **Intercropping** Groudnut + pigeonpea (7:1) (Anan 7) **Plant protection** Control late leat spot in groundnut by sprayng Carbendazim (0.1%)+ Mancozeb (0.2%) (Anan 18) Need based plant protection for the control of leat webber **Management** Contour cultivation
Soil and Nutrient Management	**Groundnut** Sand @ 40t/ha application at the time of sowing (Anan 5, 12, 17) Fertilizer dose of 20 N - 40 P_2O_5 - 20K_2O kg/ha for groundnut and groundnut + pigeonpea intercropping system. Fertilizer placement Zinc sulphate @ 50 kg/ha application for groundnut once in 3 years. Application of groundnut shells as mulch @ 5 t/ha 10 days after sowing of groundnut. (Anan 10,12) Fertilizer of 40 N –80 P_2O_5 kg/ha for pearlmillet.
Alternate Land Use System	Stylo for degraded lands and seed production
Implements	Enanti gorru for simultaneous drilling of seed and fertilizers.

Groundnut based Production System (Rajkot)

Rainwater Management	**Cultivation** Two to four interculturings along with deep ploughing in groundnut. Spreading groundnut on sloppy lands. Adopt shallow ploughing before sowing and make ridge and furrow after 25 days after sowing. At the stage of pegging, earthing up **Supplemental irrigation** Irrigate groundnut (GAUG-10) of 5 cm depth by flooding whenever there is a stress period (Rajk 26, 33)
Crops and Cropping Systems	In North Saurashtra Agroclimatic Zone to sow improved variety of pearlmillet (GHB-32) within 15 days of onset of monsoon for harvesting maximum fodder yield. Next priority should be given to fodder maize (Ganga safed-2) or sorghum (CSH-5) for better economic return

Groundnut

Grow in kharif erect groundnut by adopting ridge and furrow method of sowing.

The practice of discarding light pods and small seeds by the farmers for sowing groundnut is discouraged. The small seeds (test weight not less than 20 g) can be used effectively for sowing. With the use of small size seeds, the farmers can save seed rate to the extent of 25% i.e. >30 kg/ha

In Chotila taluk to grow either Junagadh-11 or Punjab-1 variety of groundnut keeping row spacing of 45 or 60 cm. In Dhari region, higher yields obtained with keeping row spacing of 30, 45 or 60 cm.

The farmers of Dhari and Jamkhambhalia regions of North Saurashtra Zone are advised to grow groundnut (GAUG-1 or 10) at 45 cm row spacing over 75 to 90 cm spacing. (Rajk 31,70)

Pearlmillet

For pearlmillet HB-3, row spacing of 60cm is profitable.

In North Saurashtra Agroclimatic Zone to sow late type pigeonpea BDN-2 at a distance of 75 cm between rows (Rajk 17)

Castor

In North Saurashtra Agroclimatic Zone to sow the castor GAUCH-1 at a distance of 90x45 cm

The farmers of North-west Agroclimatic zone of Gujarat should follow a crop geometry of 120x60 cm rainfed castor.

Intercropping system

Groundnut (J-11) + castor (GAUCH-1) as intercropping in the row ratio of 3:1

In North Saurashtra Agroclimatic Zone to follow intercropping system of bunch groundnut (J-11) + castor (GAUCH-1) in either 3:1 or 6:1 crop rows ratio.

The inter-row spacing of groundnut and Castor should be maintained at 45 and 180 cm respectively of 3:1 crop row ratio.

For 6:1 crop row ratio the inter – row spacing for groundnut and Castor should be kept at 45 and 35 cm respectively.

In North Saurashtra region to follow intercropping of groundnut with castor (GAUCH-1) in 3:1 ratio

Intercropping of pearlmillet + pigeonpea (2:1 and 4:1). (Rajk 29, 71)

Pearlmillet (BJ-104) should be grown in paired rows (40cm apart with a spacing of 40x 15 cm) in between two rows of pigeonpea (UPAS-120) at a spacing of 120 x 45 cm.

Sorghum + pigeonpea (1:1) with recommended fertilizer (90-30 N-P2O5 kg/ha) to base crop

Cotton (V-797) + greengram (Gujarat-1)

Cotton G.cot-10 + groundnut (J-11)

Cotton (CJ-73) with greengram or blackgram or groundnut (Rajk 64)

In Bhal region intercropping of greengram or blackgram in a paired row system of planting cotton

Mixed cropping

In North Saurashtra zone to grow pearlmillet (100% recommended seed rate) as mixed cropping with greengram (20% recommended seed rate). The mixed crop of greengram and pigeonpea with pearlmillet

Plant protection

In Ghed area of South Saurashtra zone only one interculturing 30 days after sowing in cotton V-797.

Nil to very low rainfall in early stage of plant growth, particularly in the third week of July i.e. 29th standard week was found favourable for the appearance and high build up to aphid population. Whereas continued rainfall about 20mm with 2 to 4 rainy days during this period was unfavourable. (Rajk 39)

Controlling major sucking pests (aphids, jassids and trips) in groundnut (GAUG – 10) by applying following insecticidal schedule for the farmers of dry farming areas of Saurashtra. The net ICBR obtained was 1:7.11 with two sprays and 1:4.09 with three sprays. (Rajk 48)

Spray schedule:

Insecticide	Concentration	Time of spray
Phosphamidon	0.03% @ 180 ml a.i./ha	Two weeks after notice of aphid on stickytrap
Dimethoate	0.03% @ 180 ml a.i./ha	One spray after first spray

In addition to two sprays as cited above the farmers can also go for one more additional spray with endosulfan (0.07%) @ 420 lit/ha after 15 days of second spray.
For the control of army worm and stem borer pests of hybrid sorghum CSH-6, following insecticidal schedule is recommended.

Insecticide	Concentration	Time of application
Endosulfan 4G	0.8 kg a.i./ha	Apply in whorl 30 DAS
Endosulfan 4G	0.8 kg a.i./ha	Apply in whorl 60 DAS
Endosulfan 35 EC	0.07 % spray	Apply in spray 60 DAS

In case of non-availablility of endosulfan 4G, the application of three sprays of endosulfan 35 EC 0.07 % at 30,60 and 60 DAS may be recommended as it has net ICBR of 1:1.26. It is most profitable for the farmers to follow the spray schedule for controlling both tikka and rust diseases of erect groundnut (GAUG-1)

Fungicide	Concentration	Time of spray
Mancozeb	0.2 %	35 days after germination
Carbendazim	0.025 %	50 days after germination
Mancozeb	0.2 %	70 days germination

Contingency plans
The cultivators of Bhal Agroclimatic Zone to grow safflower or chickpea instead of dry wheat

Soil and Nutrient Management

It is recommended to apply nitrogen to pearlmillet, sorghum, and cotton crops in two splits i.e. 1/2 dose at sowing and the remaining 1/2 to be top dressed after 25-35 days from sowing date for pearlmillet and sorghum and after 45-50 days after sowing for cotton when the soil moisture conditions are favourable. (Rajk 74,79,88). The top dressed dose of N should be well mixed during the suggested period and if there is a prolonged drought, the second split may be omitted this will resulted in saving of fertilizers.

Pearlmillet
The farmers of North Saurashtra Agroclimatic Zone adopting groundnut-pearlmillet crop rotation need to apply 100% of recommended dose of fertilizer only to the pearlmillet crop.
Pigeonpea (UPAS-120 or Hy –2) raised as mixed crop with pearlmillet (BJ 104) @38 N and 19 P_2O_5 kg/ha. The rate of fertilizer application should be doubled for obtaining higher production. The seed rates were 20 and 3.75 kg/ha for pigeonpea and pearlmillet respectively.
Pearlmillet HB-3 can be given 80N kg /ha.
Maximum pearlmillet grain yield can be obtained by adopting the recommended package of practices in terms of variety (BJ-104), fertilizer (75 N and 37.5 P_2O_5 kg/ha) and crop management (seed treated with fungicides), seed rate of 3.75 kg/ha and spacing of 60X 15 cm. (Rajk17)
To minimize the risk factors, the farmers growing pearlmillet as rainfed crop are advised to apply the recommended dose of nitrogen fertilizer either in two splits (25% as basal + 75% at tillering) or in three splits (25% as basal + 50% at tillering+ 25% at flag leaf stage) instead of the existing recommendation of 50% as basal and 50% at tillering. (Rajk 18)
The farmers are recommended to apply recommended dose of base crop of pearlmillet (80 N and 40 P_2O_5 kg/ha) to the intercropping of pearlmillet + pigeonpea for maximum monetary returns. The marginal farmers can obtain higher profit by applying 40 to 60 N kg/ha to the intercropping system. Phosphorus should be applied uniformly.

Sorghum
In sorghum CSH 6 apply 90 N and 30 P_2O_5 kg/ha to in medium black soils.
In dual purpose sorghum CSH 5 apply 60 N and 30 P_2O_5 kg/ha,
In rainfed sorghum apply recommended dose of nitrogenous fertilizer in three splits i.e. 25% as basal + 50% at tillering + 25% at flag leaf stage instead of the two splits of 50% as basal and 50% at tillering stage. (Rajk 46, 50)
The farmers of North Saurashtra Agroclimatic Zone (AES-1) in fodder sorghum apply 50 N kg/ha in two equal splits, basal and top dress at 30 days after sowing with 30 P_2O_5 kg/ha) to get more fodder yield and net return.

Cotton
In North Saurashtra Agroclimatic Zone apply 40 N kg/ha (equally as basal and top dressing after 45-50 days after sowing when sufficient moisture is in the soil) to cotton variety G.cot – 10 on medium black soils. For cotton variety G.cot – 10, phosphorus application is not recommended. (Rajk 5, 36)
In Dhari region, in cotton variety G.cot-10 in medium black soils (medium in P) apply 60 N and 10 P_2O_5 kg/ha. Half of nitrogen and full dose of phosphorus should be applied as basal dose and the remaining nitrogen at 45-50 days after sowing when sufficient moisture is available.

Castor
In North Saurashtra Agroclimatic Zone to fertilize castor with 30 N and 30 P_2O_5 kg/ha. (Rajk 3,9, 78,86)
The farmers of AES-IV of North Saurashtra Agroclimatic Zone are advised to apply 30 N kg/ha to castor.

Alternate Land Use System

Grasses
On sloppy fallow lands, grow *Dicanthium annulatum*

Alley cropping
In shallow soils and medium fertility to sow 16 rows of either groundnut (GG-2) or sorghum (CSH-5) in alley of perennial pigeonpea (ICPL-185) keeping distance 8.1 m between two rows for higher equivalent yield of green fodder
In shallow soils and medium fertility are recommended to sow 16 rows of either groundnut (GG-2) or sorghum (CSH-5) crops in alley of subabul (Hawai Gaint), keeping distance of 8.1 m between two rows

Implements

For multipurpose tool bar, seed-cum-fertilizer drilling attachment (manually metered) is recommended to cary out three operations i.e. fertilizer drilling, seed drilling and covering at a time for the farmers of North Saurashtra Agroclimatic Zone.

Soybean based Production System (Indore)

Rainwater Management

Broad bed furrow (BBF) for soybean in kharif
Gabion structures are recommended in waterways (Indo 85, 90,108)

Crops and Cropping Systems

Soybean-safflower sequence has been found to be more stable and remunerative in normal climatic conditions with 30 and 45 cm row spacing for the crops, respectively. (Indo 52)
Planting at a high density of 0.6 plants/ha with soybean ideotypes

Soil and Nutrient Management

60 N - 35 P_2O_5 kg/ha is recommended. Over three years there was gradual increase in the yield of soybean due to build up with 60 P_2O_5 kg/ha. Soybean is a heavy feeder of N, P, K, Ca and S. (Indo 24,93,94,112,114)

Fingermillet based Production System (Bangalore)

Rainwater Management

Watershed development
Providing a farm pond for individual holdings and making use of the excavated soil for construction of bunds and filling up the depressions reduce the overall cost of land

development. This saved on the cost of construction and is presently being adopted in all the State Watershed Development Programmes.
The existing bund itself could be modified to act as graded bund by internal land smothening Open end contour bunds (0.8 m^2)or graded bunds (0.36.m^2) on a slope of 0.2 to 0.4%. Waterways are a viable with outlets.
For every hectare of catchment the required capacity of the pond is 250 m^3. For controlling seepage and percolation losses plastering both the sides and the bottom with cement + sandy clay soil (1:8) is very effective.

Vegetal treatments
Establishing vegetative barriers either of khus or some local grass like *Nase Hullu* on the contour ensures subsequent cultivation on the contours.
Earthen embankments with vegetated spillways in stabilized gullies are sustainable as cheap water harvesting structure.
For stabilization of drop structure, spill ways and stabilization of embankments. *Pennisetum clandestinum* , and *Pennisetum ohinikere* are suitable.
Vetiver live barrier at I m vertical interval is an effective barrier as bunds under situations of lower slope (2%) and medium (>750 mm) rainfall, while combination of vegetative barrier and bund placed at 0.5 m vertical interval is most suitable under high slope (>3%).
For stabilization of water ways (0.03 m^2) and bunds, *Lotononis bainesii* is preferred
In the gullies, bamboo, silver oak, *Acacia auriculiformis*, subabul, pongamia spp. have established well.

Cultivation
Finger millet + pigeonpea sown (10:1) with dead furrow between pigeonpea rows (Bang 38, 42)
Maize on ridges and furrows across the slope is effective in reducing runoff and soil loss.
In close spaced crops like finger millet and groundnut, furrows may be opened on 0.2 to 0.4 percent slope to dispose the surplus water.
Summer tillage is essential to conservation water and reduce runoff.
Deep tillage is beneficial in crops like pigeonpea and maize.
Soil profile inversion up to 15 cm depth is suitable for higher productivity.
In widely spaced crops like maize ridging up individual crop rows for reducing run off.
Fall ploughing and furrows at 3.3 m interval as inter terrace management practices are helpful
Developing deeper soils (>45 cm) in to graded border strips of 10-12 m width on a gradient of 0.2 to 0.4 percent along the length.
Alleviation of crust is possiable with the addition of 10t FYM/ha, 5 tonne maize residue/ ha and 25 sand t /ha.

Supplemental irrigation
Surplus rainwater collected in dugout ponds and used for irrigation during critical periods.
May sown crops need one or two irrigations in June and the crops sown in August September need protective irrigation in November-December. The crop yield doubles by two protective irrigations of 5 cm each.

Crops and Cropping Systems

Cultivars
Maize, groundnut, pigeonpea, sunflower and cowpea can replace part of the finger millet area under suitable conditions.
Cowpea is a suitable crop for sowing both in the early season as well as late season.
TVX-944-02E may be used for replacing the presently recommended variety C-152 that has become susceptible to bacterial blight and rust. (Bang 1,43).
Another variety C-1 derived by a cross between C152 X FS-68 is also a high yielder with white grains. Cowpea TTB-7 released in 1987.
Maize Deccan-101, DH-3-30 and groundnut RS-114, pigeonpea HY-3c, and sunflower BSH-1 are high yielders. (Bang 5, 35)
Chilli-27 from the center (*Capsicum annum X C. frutacens*) was found to performs better.
Castor SA-2 suitable for the region.
In horsegram, IC-11095 and BGM-1-1-8-3 are released.

Cropping system

With bimodal pattern of rainfall a system of growing cowpea either for grain or fodder in May followed by transplanted fingermillet in August is an ideal double cropping system.(Bang 30, 38, 45)

Traditional intercrops like fodder sorghum, field bean and niger in finger millet can be adopted only when the fertility level is low. With improved fertility levels, an entire crop of finger millet is to be preferred.

Intercropping of finger millet and soybean in alternate rows was found profitable. (Bang 38)

Various intercrops like pigeonpea, french bean, cowpea and soybean were tried in maize but none of the combinations were remunerative.

Intercropping of paired rows of pigeonpea followed by 8 rows of finger millet (Bang 38) with a furrow between pigeonpea is recommended and widely adopted by the farmers. The system is found to be more profitable when pigeonpea is planted in May and finger millet in July. This gives opportunity and competition free time for pigeonpea to come up. Similar system is found profitable in groundnut both the crops are to be sown simultaneously.

Contingency Plans

About 40 cm of water was consumptively used by most of the dryland crops to produce reasonably high yield.

Selection of crop ad varieties for sowing should be made on the time of sowing. The following preference was found ideal.

May	Cowpea, Redgram (Bang 48, 49)
June	Groundnut, redgram
July	Maize, long duration finger millet, Sunflower
August	Short duration finger millet, transplanted fingermillet, Cowpea
September	Horsegram

Finger millet is the most stable and drought resistant crop of the region. (Bang 3,41) For early sowing in July Indaf-8 is suitable, in the later part of July and early part of August PR-202 should be selected for late sowing Indaf-5 or 9 are to be preferred.

Planting maize and pigeonpea in alternate rows of 37.5 cm provides insurance against failure of maize. In adverse years, maize is harvested as fodder allowing pigeonpea crop to mature as full season crop. (Bang 56)

For late sown conditions, intercropping of horsegram and fodder maize is more profitable than entire crop of horsegram.

Management

Cultivation up to 10-12 cm depth is sufficient for finger millet whereas deep ploughing up to 30cm was beneficial in groundnut, pigeonpea and maize.

The recommended row spacing in finger millet was 22.5 cm and in maize 60 cm. It was observed that widening the row spacing up to 45 cm in finger millet and 75 cm in maize was advantageous.

For establishing finger millet crop in July, drilling the seeds is convenient but for late establishment transplanting the seedlings becomes essential to maintain the yield levels (Bang 46)

Plant protection

Weed control in maize and groundnut through use of simazine and alchlor respectively was found effective and economical. (Bang 26)

Soil and Nutrient Management

Residue incorporation

Incorporation of maize stover residue into the soil in maize - groundnut rotation is better than in maize-finger millet rotation. Cropping and ploughing in the residues was better than discing in, the whole plant.(Bang 44)

Fertilizers

A fertilizer dosage of 50:50:25 for finger millet, 75:50:25 for maize and 25:50:25 for groundnut N: $P_20_{5:}$ K_20 kg/ha are recommended. P and K applied as basal and N at least in two equal splits for non-legume cropsBand placement is better achived through seed-cum-fertilizer drill. (Bang 9, 22, 29, 34, 35, 47)

Most of the oil seed crops (groundnut and sunflower) and pulses (cowpea) respond to lime application. Gypsum is useful in groundnut. (Bang 11, 18, 19, 52, 53, 67, 68, 1)

The red soils of the region normally have medium to high level of non-exchangeable K (510ppm). Response to the application of K is limited. However, after 8-10 years continuous cropping without K application depletes the soil reserve and crops start responding to external source of K.

Application of S 10 kg/ha for pulses and 20 kg/ha for sunflower increase the yield of crops. Zinc sulphate at 10 kg/ha improves the yield of maize.

Integration

Continues application of NPK fertilizers without addition of organic manures gradually reduced the yield levels. Organic manure either in the form of FYM (10 t/ha) or maize residue (5 t/ha) was helpful in maintaining the yield levels ad substituted for 25:25:12.5 N - P_20_5 - K_20 kg /ha.

Application of 50% recommended N through green leaf manure was good substitute for FYM to reduce cost of input.

Alternate Land Use System

Agro-forestry

Casuarinas and silver Oak are better suited than other three species like eucalyptus, neem, Leucaena, Acacia etc.

The agroforestry system adapted on bunds with silver oak, glyricidia, caliandra, casuarina and drumstick have least effect on crops and to meet various needs like fruits, fodder, fibre, fuel and timber apart from substantial income during contingent needs.

Faidherbia albida is more suitable for planting on bunds (E-W direction) in micro-watersheds.

Wastelands

Stylosanthes hamata is most suitable. *Stylasanthes scabra* should be adopted for gravelly shallow soils with low rainfall.

Acacia auriculiformis, Cassia siamea, Dalbergia sissoo, subabul and amla are more suitable and promising than other deep rooted high water intensive tree species under high gradient non-arable lands with shallow soils and rock out crops. For better establishment, trench method of planting is better than pit method.

Bamboo, Jambulina, pongamia, neem, *Albizia lebbeck*, peepal, and ficus species can be planted in the catch pits and pockets of deep soil.

Forages

Grasses like *Pennisetum pedicellatum* or *Cenchrus ciliaris* and legumes like *Microtelium axillaris* are suitable forage species.

Horticulture

In situ grafting/ budding of fruit trees like mango and ber found to be more economical than using grafted plants. Custard apple, Jack and tamarind were other species suitable to wastelands.

Mango, phylanthus, and jambulina performed better in the non-arable land.

Implements

Seed-ferti drills

For opening furrows at 3.3 m interval simultaneously with sowing the seeds of finger millet, the newly designed seed drill with furrow opener is a convenient implement

Four coultered (shoe type) seed-cum-fertilizer drill for groundnut has been released in 1987 and is being fabricated by the Agro Industries Corporation apart from several local artisans.

Five coultered, 30 cm row spaced finger millet seed-cum-fertilizer drills should be used for sowing finger millet.

Multi furrow opener is very useful tool in opening furrows for hand dropping of seeds, transplanting seedlings and also for intercultivation. The multi furrow opener has become

more popular with the farmers, because of its multi-purpose use of the several implements designed at the centre.
Groundnut seed-cum-fertilizer drill (four coulters) was found to be efficient and economically feasible for sowing soybean.
Tractor drawn international seed drill with disc type furrow openers was found suitable for finger millet

Interculture
Intercultivation in close sown crops like finger millet and groundnut can be made very effective by changing over to bent type hoe for duck foot hoe.
Staggered bent tyne and duck foot hoe are designed during the period are becoming popular with farmers.

Pearlmillet based Production System (Hisar)

Rainwater Management

Off season
Land shaping
Pre monsoon/ summer tillage and ridge furrow configurations across the land slope to improve moisture storage

Kharif crops
Two cross ploughing/ discing operation for sowing
Compartmental bund
Inter-row rainwater harvesting

***Rabi* crops**
Shallow tillage after effective rainfall events in summer fallows for *rabi* crops sowing

Crops and Cropping Systems

Kharif crops
Pearlmillet: HHB-50, HHB-60, HHB-67, HHB-68 (Hiss 20)
Mungbean: S-9, Asha
Clusterbean: RGC-936, HGS-365, HG-75, HG-182
Clusterbeans/ Mothbean: Jwala, Jadia, Marumoth-1, RMO-40
Cowpea: HFC-42-1, Charodi

***Rabi* crops**
Mustard: RH-819, RH-30, RH-781, Lakshimi (Hiss26)
Chickpea: C-235, H-208, Gaurav, HC-1
Barley: BH-87, K-226, BG-138, BG-75 9Hiss35)
Taramira: T-27

Cropping System
Monocropping is normal and below normal rainfall years
- Kharif crops – Fallow
- Fallow-*rabi* crops (in conserved moisture)

Sequence cropping in above normal rainfall years
- Pearlmillet – Chickpea
- Mungbean- mustard
- Cowpea – Mustard
- Pearlmillet + Cowpea- Mustard/ Chickpea (Fodder crop)

Intercropping (2:1 in 30/60 cm paired rows)
- Pearlmillet + mungbean
- Pearlmillet + clusterbean

Management
Sowing time
- Kharif crops in 1-15 July (optimum time) 16-30 July (late sown conditions) and *rabi* Crops 1-20 October (mustard and chickpea) and 25 October-15 November (taramira) (Hiss 50)

Plant spacing
-45 cm between rows for all crops except barley (30 cm)
-10 cm within rows after thinning in case of kharif crops and mustard

Soil and Nutrient Management

Kharif crops
Pearlmillet 40N+ 20P_2O5 kg / ha and pulses 20N+ 40P_2O_5 kg/ha (Hiss20)
Integrated use of inorganic, organic and biofertiliazers for pearlmillet

***Rabi* crops**
Mustard 40N+ 20P_2O5 kg / ha and pulses 20N+ 40P_2O_5 kg/ ha (Hiss 25)
Advance application of fertilizer by the end of monsoon for mustard (Hiss25)
Deep basal placement of fertilizer to chickpea
Integrated use of inorganic, organic and biofertiliazers for mustard (Hiss 46)

Micronutrients
Basal application of $ZnSO_4$ 12.5 kg /ha along with recommended dose of NP fertilizer to mustard and chickpea in deficient soils (Hiss46)

Alternate Land Use System

Agri-Horti system of ber intercropped with cowpea, greengram, clusterbean and anjan grass.

Implements

Ferti-seed drills
Use of ridge-seeder for pearlmillet to avoid soil crusting
Furrow seeding of mustard under receding moisture conditions
Use of barani hal for mustard seeding.

Interculture
Use of blade type wheel hand hoe to save time and energy for Interculture operations

Pearlmillet based Production System (Agra)

Rainwater Management

Land treatment
Deep tillage during summer and making compartmental bunding after seedlings emergence. (Agra 3, 14, 16)
Criss-cross ploughing by country plough after each effective rainfall.
To mitigate early season drought, one extra inter cultivation along with straw mulch @ 5 t/ha is effective. One protective irrigation is only solution to control the adverse effect of late season drought.

Supplemental irrigation
Sufficient runoff water may be harvested during rainy season in the farm pond or in village pond and this harvested water can be used in dry period during kharif and at critical stage during *rabi* season crops.
Transplantlng of pearl mllet In late seedlng condition along with one protective irrigation

Crops and Cropping Systems

Management
For growing kharif season crops the sowing period of first fortnight of July and for *rabi* crops, first fortnight of october are most suitable.
Broadcasting of seeds should be always avoided specially in *rabi* season.
The spacing between rows should be 45 cm for pearlmillet and mustard crops.

Intercropping
One row of pigeonpea or greengram in paired row planting (30/60 cm) of pearlmillet and two rows of greengram in paired row planting (30/90 cm) of pigeonpea are the best intercropping system. (Agra 5,10)
In *rabi* season, chickpea + mustard (4:1 row ratio) and barley + chickpea (3:2 row ratio). (Agra 2, 4, 8,18,25,26)

Sequence cropping
The greengram mustard crop sequence is more profitable, in which greengram is grown for green manuring after picking up the pods. The highest net profit from this crop sequence is received when mustard crop is fertilized with 45 kg N ha. (Agra 13, 19, 20)

Soil and Nutrient Management

Inorganics

Recommended dose of fertilizers are 60 kg N + 30 kg p2O5 ha for Pearlmillet, mustard and barley and 20 kg N + 40 kg P_2O_5/ ha for greengram, blackgram, pigeonpea, clusterbeans and chickpea (Agra 11, 15, 17, 21))

High and stable yield of pearlmillet is achieved through the split application of recommended N, because applied N can be saved in case of any aberration in the weather. Full N + o dose of N at sowing and rest N at tiller initiation stage is more advantageous. (Agra 1)

Method

Broadcasting application of fertilizer is inefficient Placement leads to higher yield as well as healthy and .vigrous seedlings. In *rabi* season, placement of fertilizers at 8-10 cm depth must be placed in moist zone.

Integration

In continuous cropping of pearlmillet, integrated use of organic and inorganic fertiliser is more beneficial. Half of the recommended N (60 kg) to met through FYM is a substitute of inorganic source and sound nutrient management strategy for higher and stable yield of pearlmillet.

Alternate Land Use System

Implements

Dryland weeder is quite effective and economic in controlling the weeds in both the seasons.

Pearlmillet based Production System (Dantiwada)

Rainwater Management

Crops and Cropping Systems

Intercropping

Greengram+pearlmillet (3:1)

Two lines of cowpea (GC-2) between castor (GAUCH-1) with the spacing of 120X30 cm for castor 30X7.5 cm or 30X10 cm for cowpea

Pearlmillet + clusterbeans (2:1) intercropping during kharif season

Pearlmillet + clusterbeans Malosan or HG-75 (2:2) (Danti 1)

Management

For hybrid castor GAUCH-1, inter-row spacing of 60 to 90 or 120 cm and intra-row spacing of 30 or 45 or 60 cm. (Danti 1)

Mixed cropping

In the light texture soils of North Gujarat agroclimatic Zone (AES-1) farmers are advaised to follow mixed cropping of sorghum and karingado. Sowing of karingdo in every sixth line of sorghum at 45 cm is more remunerative.

Plant protection

Castor GAUCH-1 in light soils should be kept weed free during 30-45 days after sowing preferably by two interculture operations and simultaneous hand weeding around the crop in 3rd and 5th weeks after sowing. (Danti 2)

Soil and Nutrient Management

Inorganics

Green chickpea application of 20 kg P_20_5/ha

Pearlmillet CJ-104, application of 75 kg N/ha and 25 kg P_20_5 /ha. (Danti1,3)

There is no need to apply zinc under rainfed condition of North if soil contains medium to high available zinc

For the cultivation of castor GAUCH-1 in the light soil areas, application of 30 kg N/ ha is recommended. If the soil is highly deficient in available nitrogen, application of 60 to 90 kg N/ha may be adopted.

For the cultivation of rainfed cowpea Gujarat Cowpea-2 (Chharodi –1) in light soils deficient in available nitrogen and medium to marginally high in available nitrogen and

medium to marginally high in available phosphorus, application of 15 kg N/ha and 20 kg P_2O_5/ha is recommended
The farmers growing sorghum malvan on S deficiete light textured soils are advocated to apply 20 kg S/ha through gypsum (125 kg gypsum/ha)

Alternate Land Use System

Horticulture
The farmers growing Ber (10X6 m) on light textured soils are advised to take inter crop of either greengram or sorghum (fodder)

Implements

Maize based Production System (Arjia)

Rainwater Management

Water use efficiency
Chickpea is most suitable crop for growing in tank beds on conserved soil moisture. Wheat (LOK-1) is good for sowing under tank bed conditions with125 kg/ha seed rate. (Bhil13)

Crops and Cropping Systems

Kharif crops
D-765, Surya and Navjot of maize
CSH-5, CSH-6, CSH-9, and CSH-14 of sorghum
Pusa baisakhi and K-851 of greengram
T-9 of blackgram
Gwalior-3, T-21, Prabhat, ICPL-87 and ICPL-151 of pigeonpea
JL-24 and AK-12-24 of groundnut (Bhil10)
RT-125 andRT-46 of sesamum
Aruna, Gauch-1 and Gauch-4 of castor
Macs-13 and Js-71-05 of soybean

***Rabi* crops**
Narmada-4 of chickpea (Bhil7)
Durgamani and Varuna of mustard
Bhima and JSF-1 of safflower
Chambal-1 of linseed.

Intercropping in *kharif*
Maize + blackgram (2:2)
Maize + pigeonpea (1:1) (Bhil20)
Sorghum + greengram (2:1) (Bhil 24,29,30,32)
Groundnut + sesame (6:2)
Castor + greengram (1:2) (Bhil21)

Intercropping in *rabi*
Chickpea + mustard (4:1)
Chickpea + safflower (2:1) (bhil19)

Plant protection
Apply fluchloralin or pendmethalin at 0.5 kg/ha as pre-mergence applications followed by one hoeing at 30 days after sowing to control weeds in groundnut + sesame intercropping system

Soil and Nutrient Management

Kharif crops
In maize + pigeonpea intercropping system it is recommended to apply 50% nitrogen through inorganic and 50 % through organic sources.

***Rabi* crops**
Application of 45 N - 22.5 P_2O_5 kg /ha is optimum for wheat under tank bed condtions (Bhil13, 16)

Maize based Production System (Hoshiarpur)

Rainwater Management

Kharif crops
Plough open the fields to open the soil and to enhance its water intake.
Level the land and raise bunds all around the fields and provide outlets for safe disposal of excess rainwater before the onset of monsoon.

Spread locally available mulch material, such as basooti in the standing maize crop in the last week of August in light soils.

Sow the crops across slope on sloping lands

***Rabi* crops**
Mulching the kharif crops helps in conservation of moisture in the surface layers and helps secure optimum stands of *rabi* crops. It also helps maize in case of drought. Start preparatory tillage soon after the harvest of Kharif crops.

Supplemental irrigation
Collect runoff water during monsoon in individual or community tanks.
Give one irrigation to *rabi* crops at pre-sowing or 30-40 days after sowing).
In case of drought during Kharif, a life saving irrigation can be given to the Kharif crops.

Crops and Cropping Systems

Green manure
Grow a green manure crop of sunhemp in the light textured soils which are generally kept fallow during the Kharif. Incorporate this crop in the middle of August to raise wheat in *rabi*.

Cropping system
Two crops a year viz. maize-wheat/ wheat+chickpea/ wheat+raya perform better on medium and high moisture storage soils (Hosh 18,34)

- Sow maize with first monsoon showers in rows 35-40X30 cm apart.
- Sow *rabi* crops from last week of October to last week of November
- Use higher seed rate of wheat (100 kg/ha) to cover the risk or poor germination and attack of white ants and termites.
- Sow wheat seed relatively deeper (8-10 cm) and in wider row spacing (30 cm).

Plant protection
Plough the fallow fields occasionally during kharif to keep them weed free or grow a green manure crop of sunhemp in kharif.
Apply Atrazine @ 1 kg/ha on medium to heavy textured soils as pre-mergence spray in maize. The dose of herbicide can be reduced by 40% in light soils.
Give one manual hoeing 15-20 days after sowing of maize, followed by haloding with desi plough at 30 days after sowing. (Hosh 2)
Give two hoeings to wheat to check weed growth and reduce evaporation from soil.
For termite control, treat wheat seed with Aldrin 30 EC or chloropyriphos 20 EC @ 4 ml/kg seed.

Soil and Nutrient Management

Organics
Apply 8-10 t FYM/ha before sowing maize to get maximum benefit from fertilizer use

Inorganics
In maize apply half of N and whole of P and K by drilling at sowing and broadcast remaining N one month later depending or rain. (Hosh 10,17,30)

In *rabi* crops, fertilizer must be drilled at or before sowing so as to place it in the moist zone.

Maize based Production System (Rakh Dhiansar)

Rainwater Management

Water harvesting tanks are recommended.

Crops and Cropping Systems

Green fodder or after taking one picking of short duration greengram in kharif followed by *rabi* oilseed. 15% area of the dryland kandi belt of Jammu Kathua district have adopted this technology.

Soil and Nutrient Management

Recommended fertilizer doses on N and P for

Alternate Land Use System Alley cropping with greengram/mash

Implements

Rabi Sorghum based Production System (Solapur)

Rainwater Management

Land treatment
Ridges and furrows prior to sowing of crops.
Compartmental bunds

Interculture
Minimum 3 hoeing in 3rd, 5th and 8th week from sowing for *rabi* sorghum to avoid cracking in Vertisols

Supplemental irrigation
One to two protective irrigations at critical growth stages for dryland crops. (Based on this recommendations state Govt. has changed their policy of 12 months canal irrigation for comparatively small area to 8 months (kharif and *rabi*) canal irrigation for wider area in Scarcity Zone of Maharashtra)

Vegetal covers
Spreading type of Kharif crops for land coverage to avoid soil and water erosion for sole cropping
Strip cropping (3:1)

Crops and Cropping Systems

Crop varieties
Rabi sorghum
Shallow soils – Selection –3.
Medium deep soils – M.35-1
Deep soils – Swati, CSH-13R
Kidney bean - MBS-27
Horsegram – Man and Sina (Sola 46)
Sunflower - SS-56
Safflower – Bhima
Improved varities of groundnut, castor, greengram, blackgram, cowpea, *rabi* sorghum, safflower, sunflower, chickpea were also recommended

Intercropping
Pearlmillet+kidney bean/ Horse gram (2:1) for shallow soils.
Pearlmillet+ pigeonpea (2:1) for medium deep soils. (Sola 52)
Sunflower+pigeonopea (2:1) for soils having more than 45 cm depth.
Sorghum+pigeonpea (1:1) for kharif oriented scarcity zone of Maharashtra,

Sequence cropping
Blackgram/ greengram – *rabi* sorghum (Sola 72,54,42)
Greengram/ sunflower – Bengal Gram

***Rabi* to *Rabi* crop rotation**
Rabi sorghum – chickpea
Rabi sorghum – Safflower
Safflower – chickpea

Crop management
Introduced sunflower and developed package of practices
Crop planning according to land use capability. (Sola 21)
Improved technology for Kharif and *rabi* dryland crops (package of practices)
Varities developed at the station.

Plant protection
Weed free plots in kharif crops for 1st 30 days.
Minimum 2 to 3 hoeings for other *rabi* crops

Contingency plans
Recommendation of mid season corrections for crop planning.
Aberrant weather planning with sunflower crop. In aberrant weather, plant population of 74000/ha should be reduced to 38000/ha by removing alternate plant in the row or skipping of alternate row.

Soil and Nutrient Management

Inorganics
Cereals and oil seeds –50 N + 25 $P_2 0_5$ kg /ha
Pulses – 12.5 N + 25 $P_2 0_5$ kg /ha

Organics
Leucaena loppings mulching in kharif season (10 t/ha) for enrichment of soil fertility and to reduce soil and water erosion. (Sola 15,30,66)
Recycling of farm waste materials

Alternate Land Use System

Agro-horticulture
Ber, custard apple, pomegranate, amla with intercropping of kharif (spreading) crops

Silvi–pastures
Stylo in initial 1-2 years of main crop
Cultivation of Marvel-8 grass on bunds for protection of bunds and for fodder.
Contour live bunds of Marvel-8 of Leucaena.

Implements
Bullock drawn two bowl ferti-seed-drill

Rabi Sorghum based Production System (Bijapur)

Rainwater Management

Land treatment
Rubbles at 0.3 m vertical interval on contour key lines for between soils water conservation.
In-situ moisture conservation practices like compartmental bunding, ridges and furrows, contour cultivation and fall ploughing helped to conserve more moisture in deep black soils. (Bija 19, 37, 38)

Vegetal covers
Barriers are recommended for inter-terrace land management practice, planting of khus grass and subabul in paired rows at vertical interval of 0.3 m is advocated.
Stabilization of bunds through stylosanthes species.
Bund palnting with neem, sissoo and tamarind.

Microcatchments
For ber in marginal lands, rectangular basins with 5% inward slope for lands upto 2% slope, crescent bunding for lands having 2 to 4% land slope and staggered trenching/ pitting for lands having more than 4% land slope.

Supplemental irrigation
A farm pond of 150 m^3 capacity for every one hectare catchment was recommended for harvesting excess runoff in medium to deep black soils. Dryland horticultural crops with supplemental irrigation facility.

Crops and Cropping Systems

Management
Adoption of early sowing of *rabi* crops is essential - *rabi* sorghum, safflower 2nd fortnight of September and 2nd week of August is suitable for sunflower.
Wider row spacing for both Kharif and *rabi* crops - Sorghum, Sunflower, Safflower and Pearlmillet 60 cm; Groundnut (bunch) 45 cm; Chickpea 30 cm; Pigeonpea 90 cm

Cultivars
Sunflower population (NSP-92-1-0E) which is superior to Morden is released for general cultivation.

A bunch groundnut variety (R-8808) and horsegram (PL-40) were released and included in the package of practices.

Intercropping
Pigeonpea + pearlmillet (1:3) (Bija 35)
Chickpea + safflower (3: 1or 4:2)
Chickpea + sorghum (1:2)
Pigeonpea + groundnut (1:3)
Pearlmillet + groundnut (1:2)

Soil and Nutrient Management

Inorganics
For Kharif crops (pearlmillet and sunflower) in shallow black soils, application of 50% dose at sowing and remaining 50% 30-35 days after sowing is advocated. (Bija 16,42,46)

Incorporation
Subabul loppings at 5 t/ha one month prior to sowing of *rabi* sorghum to reduce the fertilizer requirement of sorghum by 50%
Sunhemp in Kharif in medium and deep black soils after 35-40 days after sowing for *rabi* crops to save 50% nitrogen.
Crop residues at 5t/ha in vertisol. To reduce the C:N ratio of residues the conjunctive use of subabul or 20kg N/ha urea or cellulolytic organism is recommended. (Bija 34)

Cropping systems
Adopt rotation of sorghum after chickpea, which accounts for 50 per cent saving of N for *rabi* sorghum. (Bija 42)
Use of 50 percent nitrogen through organic source and remaining 50 per cent through inorganic source for sorghum and safflower. (Bija 16, 51, 53, 54)

Alternate Land Use System

Horticulture
Cultivation of mango, ber, sapota and curry leaf in the zing conservation bench terraces, waterways and on the embankment of farm ponds.

Wastelands
In shallow and marginal eroded soils, growing of agave and subabul is advacated.

Implements

Cotton based Production System (Kovilpatti)

Rainwater Management

Crops and Cropping Systems
For the vertisol belt of this region, cotton+blackgram (Kovi 29)
Sorghum+Blackgram/ Cowpea (Kovi 12,18,21,27,47,61,63)
Pre-monsoon sowing of Cotton MCU.10 + black gram CO.5 intercropping system receiving 750 kg/ha FYM
Fertilizer DAP as seed treatment material for rainfed cotton. Both linted and lelinted cotton seeds soaked with 2% DAP increased seed cotton yield.

Soil and Nutrient Management
The basal application of 40N and 20 P kg/ha was recommended for cotton crop under rainfed vertisol situations. (Kovi 5)

Alternate Land Use System

Implements

Cotton based Production System (Akola)

Rainwater Management

Land treatment
On slopy land contour cultivation along vegetative hedge of Vetiver or Leucaena at 0.5 m V.I. in sorghum and cotton crops.
BBF and opening of furrow after two crop rows in pigeonpea.

Slope length
From the toposequence study of micro-watershed, on a slopy field instead of growing cotton crop on entire field, it is profitable to take cotton on upper toposequence (80 % area) and soybean- chickpea crop sequence on lower topo sequence (20 % area).

Supplemental irrigation
Sorghum can be grown without irrigation
Cotton crop needs life saving irrigation during deficit period

Crops and Cropping Systems

Crops
Cotton, sorghum and pigeonpea recorded highest yield on class II soils, followed by class III and lowest yield was found on class IV soils. Sorghum crop recorded response to fertilizers on all three classes of soil, whereas cotton and pigeonpea registered response on class II and class III soils.
Sorghum (CS -3541) and sesamum crops grown on shallow soils without much reduction in yield as compared to the yields on medium deep soils. Cotton (AKH 081), a early variety of *hirsutum* cotton is suitable on shallow soils. Cotton, pigeonpea and hybrid sorghum are not suitable on shallow soils.

Intercropping
Sorghum + greengram (2:1 or 1:1) and cotton + greengram (1:1) i
Greengram-safflower crop sequence
Sorghum - chickpea If rains occur in *October* and November

Plant protection
Critical crop-weed competition period in hybrid sorghum and cotton was from sowing to 40 days and 55 days, respectively.

Contingency plans
Under situation of resowing or delayed sowing in *kharif* season, sunflower, pearlmillet, pigeonpea, maize and castor crops recorded satisfactory yields.

Soil and Nutrient Management

Inorganics
Application of 20 kg P/ha was found optimum for pigeonpea and cotton, while 10 kg P/ha was optimum for sorghum crop.
Application of 80 kg P/ha to pigeonpea for continuous three years recorded residual effect on sorghum.
Zinc application @ 5 kg Zn / ha (25 kg Zn SO 4/ ha) to sorghum.

Integration
In cotton + greengram, half dose of nitrogen through FYM and half through inorganic fertilizers
In alley cropping (9 m width), incorporation of Leucaena loppings in cotton or sorghum crops, recorded 25 to 50 % economy in fermer use
Continuons use of Leucaena lopping was found to replace *full* recommended dose of nitrogen.

Alternate Land Use System

Horticulture
Ber agro-horticulture system *(Ber* + short duration legume crop) was found more remunerative than anola and custard apple horticulture system.

Pastures
Stylo sole and stylo-marvel pastural system recorded higher green fodder yield than sole or combination of grasses.

Implements

Out of eight ferti-seed drills tested, Shivaji, Solapur, CIAE and Malviya ferti-seed drills proved better on the basis of Overall Performance Index (OPI), but seeding with CIAE ferti-seed drill recorded higher yield of greengram and safflower recorded higher yield of greengram and safflower.

4. Subject Index

All India Coordinated Research Project for Dryland Agriculture
Central Research Institute for Dryland Agriculture
Santoshnagar, Hyderabad 500 059

For on-line edition visit : http://dryland.ap.nic.in