

ISO 9001:2008 Organization

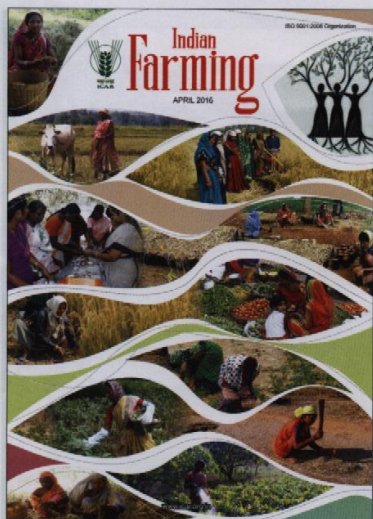


Indian Farming

APRIL 2016



www.icar.org.in



Cover I: Women play a vital role in agriculture

ADVISORY BOARD

Chairman : A K Singh

Members

- J S Chauhan • Sanjeev Saxena
- S.K. Dhyani • Jyoti Misri
- T.P. Rajendran • Ashwani Kumar
- Pitam Chandra • Ravinder Kaur

Project Director, : Rameshwar
DKMA : Singh

Incharge (EEU) : Aruna T Kumar
Editor : Reena Kandwal

Chief Production : V K Bharti
Officer

Production : K B Gupta

Senior Artist : Narendra
Bahadur

For editorial queries contact
Reena Kandwal
011-2584 1004, 2584 1960 / 610
e mail: indfarm@icar.org.in
indfrm@icar.org.in

For Subscription and Advertisement,
Contact:

S K Joshi

Business Manager, DKMA, ICAR
Krishi Anusandhan Bhavan I, Pusa
New Delhi 110 012
Telephone: 011-2584 3657
Fax: 011-2584 3657
e-mail: bmicar@icar.org.in

Subscription

Single Copy : ₹ 30
Annual : ₹ 300 (inland)
: \$ 50 (overseas)



Indian Farming

In This Issue

Editorial	1
Seed Requirement for future demand of major cereals and millets <i>Shankar Lal and Rajeev Kumar Singh</i>	2
Crop Diversification with Vegetable Cowpea: for improving productivity, resource-use efficiency, soil and human health <i>Sudhir Kumar Rajpoot and D S Rana</i>	5
Azolla Cultivation and its Use as alternative green fodder for livestock <i>Ajesh Kumar, A P Biradar and P S Pattar</i>	10
The Role of Women in agriculture <i>Vikender Kaur</i>	14
Agri-Nutri Smart Villages—A leap towards ensuring nutritional security in India <i>V. Sangeetha, Premlata Singh, Girijesh Singh Mahra, Sujit Sarkar, Satyapriya and Sangeeta Upadhyay</i>	17
The Green Desert <i>Suresh C. Modgal</i>	21
Organic Farming, feeding the soil to feed the plant <i>N A Ganai, T A Shah and S A Hakeem</i>	25
Development and Production of Agricultural Machinery using computer-aided design <i>Hijam Jiten Singh, Mukesh Kumar Singh, N S Chandel and K P Singh</i>	28
Cultivating <i>Desi</i> Cotton for securing livelihood of farmers in dryland saline areas of Gujarat <i>Nikam Vinayak Ramesh, G Gururaja Rao, Anil Chinchmalatpure and D K Sharma</i>	31
Reservoir Fisheries Development through community participation <i>Kiran Dube, Neelam Saharan, Chandra Prakash, V K Tiwari, K D Raju and W S Lakra</i>	34
Current Status of Pesticide use in India and its impact on women's health <i>Nithya K and Deeksha Joshi</i>	39

Attention !

- All disputes are subject to the exclusive jurisdiction of competent courts and forums in Delhi/New Delhi only.
- The Council does not assume any responsibility for opinions offered by the authors in the articles and no material in any form can be reproduced without permission of the Council.
- The Council is not responsible for any delay, whatsoever, in publication/delivery of the periodicals to the subscribers due to unforeseen circumstances or postal delay.
- Readers are recommended to make appropriate enquiries before sending money, incurring expenses or entering into commitments in relation to any advertisement appearing in this publication.
- The Council does not vouch for any claims made by the authors, advertisers of products and service.
- The publisher and the editor of the publication shall not be held liable for any consequences in the event of such claims not being honoured by the advertisers.

Cultivating *Desi* Cotton

for securing livelihood of farmers in dryland saline areas of Gujarat

Nikam Vinayak Ramesh¹, G Gururaja Rao², Anil Chinchmalatpure³ and D K Sharma⁴

ICAR-Central Soil Salinity Research Institute, Regional Research Station, Bharuch, Gujarat 392 012.

COTTON crop has been cultivated in throughout the world since time immemorial, reference of the same can be found in Hindu Rig Veda hymns also. Globally, this crop is cultivated in more than 70 countries in all five continents covering an area of 36.01 million ha of which India accounts for 12.19 million ha (25% of global area). World level production of cotton is 26.88 million tonnes of which 6.05 million tonnes (18%) is produced in India (CCI 2015). Though there are more than 50 species of cotton, only four of them are cultivable, viz. *G. herbaceum*, *G. arboreum*, *G. hirsutum*, and *G. barbadense*. First two are diploid and are called old world cultivated cotton while next two are new world cotton which are tetraploid. India has distinction of commercially growing all four species of cotton.

In India, sea of changes could be observed in pattern of cultivation of cotton. Traditionally, India cultivated desi cotton varieties (*G. herbaceum* and *G. arboreum*) which remained

popular with the Europeans and other countries for hand-woven and extremely fine muslin. At the time of independence, desi cotton accounted for 97% area of the country. Introduction and promotion of American cotton and hybrid varieties resulted in reduction of area under desi cotton to 42% in 1990 which further reduced because of Bt cotton wave of started in the year 2002 and with accordance of official permission for cultivation of Bt cotton in India, this area further reduced to 3% in 2013 (A T Pyati, Deccan Herald, 3 Sept 2013). However, this pattern of change was not observed in rain fed areas of Rajasthan, Gujarat and Karnataka.

What caused survival of desi cotton against wave of Bt hybrids?

Tolerance of *desi* cotton to biotic and abiotic stresses has been its great strength. It has immense inherent ability to withstand abiotic stresses like drought, salinity/sodicity, etc. In such areas, choice of desi cotton is not preferential but obligatory for the

farmers. It is tolerant to biotic stresses like curly leaves, bacterial blight, and comparatively tolerant to bollworm complex. Owing to these factors, desi cotton cultivation is less expensive when compared to hybrids or Bt hybrids and is more eco-friendly. It has got coarse, strong and clean stretchable fibre which fulfils the requirement of denim culture. Demand for desi cotton is increasing because of huge market in the medical field for surgical cotton, cotton swab, sanitary napkins etc and in quilt manufacturing because of high water absorption capacity.

Though desi cotton is endowed with many good qualities, certain aspects like low yield, long duration, small boll size, absence of well established seed production system etc. form the limiting factors in its adoption on larger scale. However, because of high demand and more price for desi cotton in market; high cost of cultivation of Bt hybrids; development of resistance among the insects for the Bt hybrid and farmers movement in the states like

In saline rainfed areas of Gujarat, where availability of canal water is scarce and ground water is saline, desi cotton (Gossypium herbaceum) serves as a lifeline to secure livelihood of farmers. Because of its inherent characteristics like low water requirement, lower susceptibility to pest and diseases, minimum cost of cultivation, it enables resource poor farmers to get sufficient income from available resources. Field trials of desi cotton (G Cot 23) in Bhal areas of Gujarat have shown that it gives comparatively better yield (up to 12 q/ha) in dryland salinity. Farmers were satisfied with the characteristic of desi cotton which helps it to tolerate salinity and drought like situation, however showed negative perception about its longer life cycle, low yield as compared to Bt hybrid. Provision of quality and improved seed of desi cotton to the farming community in this area is likely to help in increasing yield of cotton, income and standard of living of the farmers in the region.

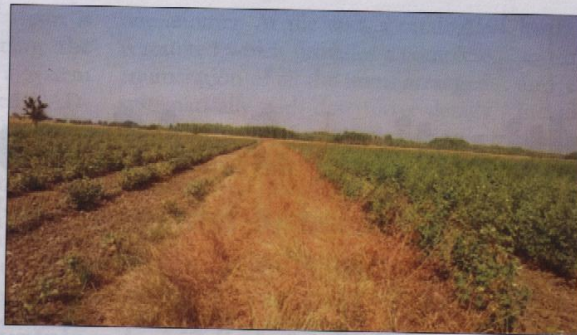
Karnataka, Maharashtra, desi cotton has set to revive.

Salinity tolerance in desi cotton

Features of desi cotton like deep root system and longer life cycle helps it to get acclimatised to salinity in the vegetative phase; hence impact of salinity during flowering and boll formation/boll drop is negligible as compared to Bt hybrid. Desi cotton possess higher salt tolerance and showed lower yield drop at salinity more than 8 dS/m. Because of its tap root system and low water requirement, desi cotton performs comparatively well in rainfed situation making it an ideal option for rain fed areas of Bhal area, Bara tract (South Gujarat) and Saurashtra region of Gujarat. Research conducted at ICAR-Central Soil Salinity Research Institute, Regional Research Station (ICAR-CSSRI, RRS) Bharuch has resulted in identification of ideal herbaceous cotton cultivars for rain fed and saline area of Gujarat like G. Cot 23, G Cot DH 7, G Bav 109 and G Bav 120. Field data of farmers from Bara tract area (Jambusar, Vagra and Amod taluka of Bharuch district) was collected using personal interview method to see prospects and impact of desi cotton in dryland saline area of region.

Case study from Bara tract area of Gujarat

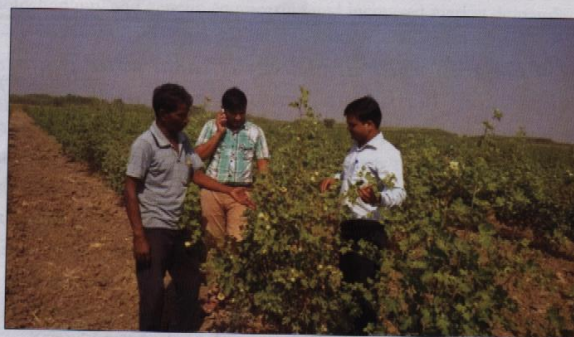
Laxmanbhai Rathod, a 44 year old farmer from Kalak village of Jambusar taluka of Bharuch district has been growing desi cotton since last 12 years. In his field, salinity at surface (0-30 cm) is 1.8 dS/m while at subsurface (60-90 cm) it ranges from 3 to 5 dS/m; pH 8.7 at surface and 9.3 at the subsurface. His experience shows that input and labour cost for desi cotton (G Cot 23) was ₹ 6,000 per acre. He did not apply any irrigation and no pesticide and fertiliser



Visible difference between desi cotton (right side) and Bt hybrid grown in adjacent field in saline environment of Bara tract area of Gujarat

were used. However, he carried out three inter culture operations and two weedings. He could achieve yield of 4 q/acre for desi cotton. With price of ₹ 4,300/q, he earned ₹ 17,200 gross and ₹ 11,200 net income per acre. When asked about his opinion about desi cotton, he says laughingly "Bt hybrid cotton is like an english man while desi cotton is like a desi man, not much affected by climatic variation and infestation of insect and pest".

In the entire Bara tract, ground water is saline and not suitable for irrigation. In the areas where canal water is not available, farming is totally dependent upon available soil moisture stored during rainy season. Because of more water retention capacity of black cotton soil (which is prevalent in the area), soil moisture remains available till March-April below the depth of 30 cm. Tap root system of desi cotton utilises this soil moisture and survives the harsh heat of summer in this region. Moreover, its water requirement is lower, making it ideal option for farmers to secure their livelihood and sustain the



Farmer Laxmanbhai Rathod providing information to scientist about desi cotton

agriculture and agro-ecosystem in the region.

Perception and satisfaction of the farmers for desi cotton

Study elicited both positive and negative response of the farmers about desi cotton. Less cost of cultivation was perceived by farmers as biggest advantage of desi cotton. Many farmers in this region do not apply fertilizers, pesticides to the desi cotton.

Farmers perceived that desi cotton was better option for them because of harsh environment conditions like soil salinity, ground water salinity coupled with less rainfall. In saline condition, less boll drop was observed in desi cotton. Farmers were also happy with reduced incidences of pest and diseases in case of desi cotton which kept them away from frequent and costly affair of adopting plant protection measures. Farmers believed that cultivating desi cotton helps in sustainability of the agro-ecosystem of the region.

Study also evinced some negative aspects of desi cotton in the region. Longer duration of desi cotton was perceived as major disadvantage by the farmers. Long life cycle of desi cotton brings multiple problems to farmers. First, longer duration leads to late harvesting of cotton (upto April-May months), when weather is more hot and warm, resulting in loss of weight of cotton and sometimes yellowing of the lint. Second, fluctuating market also leads to non-appreciable returns during April-May months. Third, because of more heat in the months of April and May, labourers refuse to work in field or demand more money for picking (picking charges in the month of November-December are ₹ 4/kg while in April and May month are ₹ 7/kg) and thus increasing cost of cultivation. Agronomic characteristics like small size of boll in case of desi cotton was negative aspect reported by the farmers, moreover bolls do



Growth of desi cotton under saline conditions in Jambusar taluka of Bharuch district

not open completely causing difficulty in separating seed lint from the dried boll. Whatever be the limitations of the desi cotton, its advantages outweighs disadvantages and is an ideal and sole alternate to the farmers in this dry land salinity area.

Cultivation practices and cost involved for desi cotton

Field preparation is mostly carried by tractors by the farmers either their own or hired. Many times sowing operations are also carried out mechanically using seed drill designed for cotton purpose. Farm yard manure is added once in three years while very less amount of chemical fertilisers were used. In rain fed situation, farmers applied up to 20 kg urea per acre, up to 15 kg DAP per acre while in irrigated condition

doses of urea and DAP were 100 and 50 kg/acre, respectively. On an average, two interculturing operations were carried out by the Farmers. Farmers perceived that more number of interculturing operations helps in reducing weed problem and increasing the yield. Expert recommends 2 to 3 interculturing operations; because though more number of interculturing helps in increasing yield of the cotton, it adds additional cost to farmers, increasing cost of cultivation and ultimately reducing the net profit. Number of weedings ranged from 0 to 3 and one noteworthy thing observed was that no weedicide was used by the farmers. In surveyed area of Bara tract, it was observed that farmers had not applied any insecticides and pesticides for the desi cotton. This is the main reason behind reduced cost of cultivation of desi cotton, unlike Bt hybrid where it forms major chunk of high cost of cultivation. Picking operation starts in the month of February, continues till the month of May. High cost of labour during summer for the picking is the one of the major drawback because of its longer life cycle.

Availability of quality seed and policy implications

Farmers in this area generally maintain their own seed for desi cotton, which has been cultivated since long time. Those who are not able to produce their own, purchase it from fellow farmers or some local sources. After meeting their own demand, excess seed produced by farmers is sold to others at the rate of ₹ 40 to 100/ kg. Some farmers have started producing seed for

commercial purpose also. However, this has been handed down from generation to generation resulting into admixture of seed varieties resulting into quality deterioration. Expert believes that it is one of the major reasons behind low yield of desi cotton.

This situation demands that quality seed of desi cotton should be made available to the farmers, so as to get good produce and income to the farmers in saline and rain fed areas. Our experience has showed that farmers are ready and eager to take proactive steps for quality seed production. For providing quality seed of desi cotton, farmer's participatory seed production programme may be initiated with the help of ICAR institutes, SAU, state government, NGO and Kisan Mandali (farmer's cooperatives in Gujarat) from this region.

SUMMARY

Farmers in Bhal area of Gujarat are facing problem of dryland salinity coupled with saline ground water and have no other option but to go for desi cotton cultivation. Improved varieties with short duration life span will be bonanza to these farmers. Availability of quality seeds of improved varieties is likely to have beneficial impact on livelihood of farmers and sustainability of the cotton agro-ecosystem.

¹Scientist (e mail: vr.nikam@icar.gov.in), ²Principal Scientist (e mail: gg Rao54@yahoo.com), ³Head (e mail: anil.rc@icar.gov.in), ICAR-Central Soil Salinity Research Institute, Regional Research Station, Bharuch, Gujarat 392 012. ⁴Director (e mail: dk.sharma@icar.gov.in) ICAR-Central Soil Salinity Research Institute, Karnal, Haryana 132 001.

FEW FACTS

- The word 'cotton' is derived from 'qutun' or 'kutun', an Arabic word used to describe any fine textile
- Cotton dates from at least 7,000 years ago making it one of the world's oldest known fibres
- Archaeologists found 5,000 year old cotton fabric at Mohenjo Daro, an ancient town in the Indus River Valley of West Pakistan
- The Aztec civilisation used naturally coloured brown cotton as a principal form of payment
- Denim fabric was initially produced in Nimes, France and denim derives its name from 'serge de Nimes' ('fabric of Nimes')
- Cotton is produced in more than 100 countries in the world, but six of them – China, India, Pakistan, USA, Brazil and Uzbekistan – contribute about 80% of production
- There are 43 species of cotton in the world.
- Cotton can absorb up to 27 times its own weight in water
- The cotton plant requires about 180 – 200 days from planting to full maturity ready for harvest
- China is the world's largest cotton importer and is also the biggest producer

Courtesy: <http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-interesting-cotton-facts>