Annual Technical Report
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ICARDA - ICAR

Project # 9
Sustainable Intensification of Silvopasture Systems

Project # 10
Assessing Adaptability and Utilization Potential of *Opuntia ficus-indica* in Low Rainfall Regions of India

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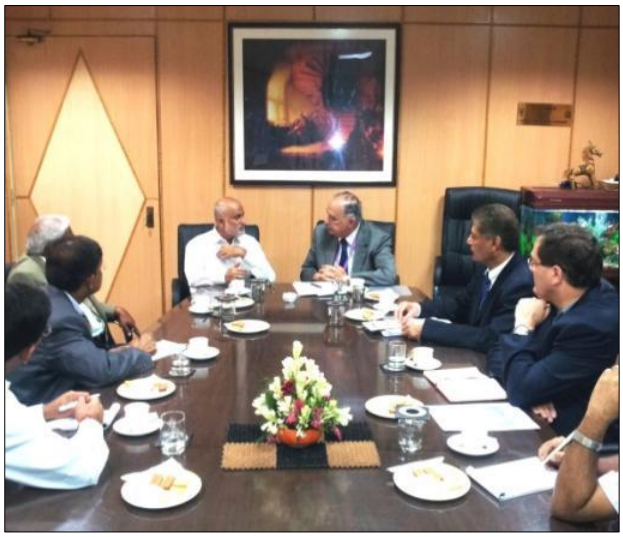
Executive Summary

India holds a substantial rangeland area, most of which is in the state of Rajasthan. The livestock sector is vital for the rural poor in the region and it is the main source of income. Advanced degradation of rangelands due to lack of proper management tools and the communal land tenure regime are leading to an increasing threat of desertification. Lack of adequate nutrition (due to overgrazed community rangelands), inappropriate management practices and restricted access to health services are the major causes of low productivity of small ruminants. Very little attention has been given to dryland areas for research on feeding and management of small ruminants for effective economic rearing.

Interventions that focus on community rangelands and feed and fodder issues could have pro-poor effects because small ruminants' keepers are heavily dependent on natural resources for grazing and watering their animals. However, these resources are declining in condition and increasingly subject to access restrictions. A critical understanding of and need for evolving appropriate management systems to improve the productivity of small ruminants is imminent for drylands.

Under the umbrella of the ICAR-ICARDA collaborative research program several new projects were approved for the period 2014-2017. Among them two projects related to community based rangeland management and utilization potential of cactus pear (*Opuntia ficus indica*) in low rainfall regions of India by reducing the feed gap and scarcity that many livestock farmers are facing. The main purpose of these projects is to improve the livelihood of small holder farmers in the drylands of India improve fodder availability and. Such an effort has the possibility to reduce poverty and increase food security. Adequate nutrition and management practices are some of the leading causes for low livestock productivity. The diversification of crops aims to improve animal nutrition. The project also teaches sound management practices. Both the promotion of *Opuntia ficus indica* and sustainable silvopasture practices show promise in project sites. The annual report will review the current progress to date for these efforts. As the MOA was signed on the last day of 2014 (Appendix 1), the report reflects activities that took place since then.



Project # 9: Sustainable Intensification of Silvipasture Systems


Collaborators

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Introduction

Grazing lands such as permanent pastures, fallow land, gochar, oran etc., which occupy about 50% of land, play important role in providing fodder to livestock in the arid region, even though , their productivity is very low. Nearly 1/3rd area of arid zone of Rajasthan are wastelands, of which 50% are grazing lands and 45% are sandy wastes (Balak Ram *et al*. 2003). The production from the available grazing lands is hardly 300-400 kg/ha (Pratap Narain and Rajora 2005). The low productivity is attributed to mismanagement, degradation and over grazing of pasture land coupled with low rainfall. Farmers were selected for adoption of technology packages as per their need and suitability, socio-economic concern and demographic profile through group discussions. The project first identified improved forage grasses and tree crops that could be promoted through the project.

Livestock based farming system makes significant contribution for livelihood security of farmers in arid zones of India. However, availability of fodder for livestock is not sufficient due to water scarcity and land degradation leading to low productivity of grazing lands. The arid zones are less suitable for crop production due to inherent soil constraints like low water retention, sandy texture, shallow depth, occurrence of rocks and stones. However, some grasses and tree species of forage value and economic importance can grow well and help in augmenting forage production. Silvipasture offers a sustainable land use system which increases overall productivity of land and make efficient utilization of natural resources.

Goal

To evolve an appropriate community management system that leads to improvement in productivity of rangeland and livestock.

Objectives

- To empower agro-pastoral and pastoral communities through the reinforcement of local institutions and their effective participation in designing, implementing and monitoring of rangeland/livestock related interventions.
- To refine rangeland management techniques in context of its adoption at community level.
- To enhance capacity development of all stakeholders through exposure visits, trainings and other extension activities.
- To develop policy relevant guidelines for rangeland management.

Benefits of Silvipasture

Silvipasture is the practice where livestock and the forage component is integrated in the Agroforestry production system. Traditionally parkland agroforestry was common in most of the arid and semi-arid parts of India. In systematic agro-forestry systems, trees or shrubs are planted in rows at a wide spacing creating alleyways where animals can graze in between. The grazing alleys can consist of either annual forage crops or native pasture. In India, this system is known as Silvipasture. In arid environments with rainfall less than 200 mm annually, this is an

important practice to improve forage production in places that have high supplementation needs to feed animals. Silvipasture can be used to rehabilitate pastures and prevent erosion. When using drought tolerant species it is ideal for harsh climate conditions for areas with limited rainfall and a high risk of drought. Diversifying forage crops in multi-crop systems can be important for improving diet quality. This practice also extends the grazing season by reducing drought. This is achieved by increased water infiltration in the micro-catchments that shrubs and trees provide. It also improves the organic layer in soil by preventing erosion and contributing bio matter. Increased organic matter increased the water holding capacity of soil. The canopy of shrubs also creates micro-habitats and refuges for native species. Silvipasture presents a way to sequester carbon and still allow for grazing of livestock. As a result it is a system that addresses multiple problems while deriving multiple benefits.

Grasses Used in Silvipasture

The productivity of these lands can be enhanced by growing drought hardy nutritive pasture grasses such as *Cenchrus setigerus.* This grass performs well on degraded lands, improves soil conservation, and provides nutritive fodder to livestock. Prior to this project, CAZRI conducted participatory on-farm trials at farmers' fields to assess the performance and production potential of pasture grasses under different farm conditions and to demonstrate improved technology of pasture development. This was done to increasing the quality and quantity of fodder to sustain livestock in the region. Range grasses i.e. *C. ciliaris* and *C. setigerus* were sown in third week of July 2011 on protected common land having gravelly type of soil with poor soil fertility, on bunds and field strips and on boundaries of arable land of Harsolov and Dehri villages of Merta and Jayal tehsils respectively. As a result these successes will be scaled in this project by promoting *Cenchrus setigerus* in Silvipasture systems. A flyer on *Cenchrus setigerus* was created and can be seen in Appendix 2.

Cenchrus setigerus

Cenchrus ciliaris

Trees/Shrubs Used in Silvipasture

Prosopis cineraria is promoting through the project as a tree crop in conjunction with *Cenchrus setigerus* due to its drought resistant characteristics and ability to tolerate high saline and alkaline environments. It is native to Rajasthan and is not a new introduction. *P. cineraria* can resemble a bushy structure if cut above ground level as it will produce numerous new buds and shoots that can then be grazed. However promoting its use it beneficial as the pods are highly desired by livestock and a source of protein. Green pods are also incorporated into many local dishes.

Prosopis cineraria

Other trees and shrub crops can be used for silvipasture however this is one of the most drought tolerant. A flyer on silvipasture was created by the project, see Appendix 3. The flyers talks about the use of *Prosopis cineraria* for forage and fodder in arid silvipasture systems. To provide further information on the species to the general public another flyer on *Prosopis cineraria* was created to promote the utilization of the species further, see Appendix 4 for the *Prosopis cineraria* flyer.

Characterization of Community Grazing Resources

Site description

The experiment is conducted in Azitnagar, Bavarli in Jodhpur. This site was chosen based on its representative characteristics for arid areas in the region to assure that project efforts are scalable as well as their demographic characteristics which are also representative of the region. The land tenure is communal land that has been allocated for project research and outreach.

Tables 1 through 3 present an overview of the land use as well as selected demographic characteristics of the livestock and household.

Table 1: Land use pattern of Ajeet Nagar, Bawarli, Jodhpur Rajasthan (2014 census)		
Sl. No	Particulars	Area (ha)
1	Total geographical area	818.90
2	Net cultivated area	668.16
3	Rainfed area	668.16
4	Irrigated area	0
5	Grazing lands (village commons)	145.28
6	Forest area	0
7	Other	5.46

Table 2: Demography of village Ajeet Nagar, Bawarli, Jodhpur (2011 census)		
Sl No.	Particulars	Numbers
1	Total human population	1044
2	Male	546
3	Female	498
4	SC	Nil
5	ST	Nil
6	Household number	186
7	Demographic profile of village (major communities)	Jats, Rebari and Mirachi Muslims

Table 3: Livestock population of village Ajeet Nagar, Bawarli, Jodhpur (2012 census)		
Sl No.	Livestock species	Numbers
1	Cattle	122
2	Buffalo	77
3	Goat	83
4	Sheep	309
5	Camel	33
6	Others	0

Furthermore a project baseline survey to evaluate the impact of silvipasture practices has been developed (Appendix 5).

Experimental design

The experimental design consists of strip plot design with four treatments and three replications (Table 4). A spacing of 1m x 1m was used for the grasses and a spacing of 10m x 10m was used for the shrubs. For forage grasses *Cenchrus ciliaris* and *Cenchrus setigerus* were tested with two shrub species *Mimosa hamate and Grewia tenax. Mimosa hamata* (Hindi: Alāy shrub (अलाय) is a species of flowering shrub in the pea family, Fabaceae, that is native to the Thar desert of the Indian subcontinent. *Grewia tenax* belongs to the family Tiliaceae, is an example of multipurpose plant species which is the source of food, fodder, fiber, fuelwood, timber and a range of traditional medicines that cure various perilous diseases and have mild antibiotic properties. Observations to be recorded include vegetation cover, biomass yield, species diversity, etc.

Table 4: Experimental design - Ajitnagar, Bawarli, Jodhpur

Replication 1	*M. hamate + C. ciliaris*	*G. tenax + C. ciliaris*
	M. hamate + C. setigerus	*G. tenax + C. setigerus*
Replication 2	*G. tenax + C. ciliaris*	*M. hamate + C. ciliaris*
	G. tenax + C. setigerus	*M. hamate + C. setigerus*
Replication 3	*G. tenax + C. setigerus*	*M. hamate + C. setigerus*
	G. tenax + C. ciliaris	*M. hamate + C. ciliaris*

The results will be used to determine which technology or best bet practice has the greatest forage production as well as generating income (multi-purpose species). Such knowledge can be scaled out to other areas as the research site is similar to many arid areas in western India.

Empowering Pastoral Communities

A key component of this project is the capacity development of all concerned stakeholders. In particular agro-pastoral communities with emphasis on woman. Research activity is developed with community involvement to insure its sustainability and adoption. To increase awareness of project efforts two field days were conducted:

1. The first field day took place on 25 of February 2015 in Rajor Ki Dhani (Luni Panchayat Samiti, Jodhpur) during the visit of Dr Mounir Louhaichi (ICARDA Rangeland Scientist). A total of 37 participants attended this event (27 male and 10 female). The participant roster can be found in Appendix 6.

2. A separate training for women farmers on improved practices and economic benefits was also conducted on the 25 of March 2015 with 63 women and 13 men participants (Appendix 7). The training main theme was about the “Role of women in pasture and livestock production". In particular, the following sub-themes were discussed with the farm women during the training:

- Importance of pasture and its utilization for higher pasture and livestock productivity
- Cut-and-carry system and grazing system of pasture utilization

Concluding Remarks of Silvipasture Project

The first few months of the project have been fruitful in laying the ground work for the project. Much of the initial efforts have focused on building community awareness and participation. It is believed that this is important to ensure the sustainability and long term impact of the project so that project results are scalable and adaptable over the long term. Informational flyers were created for silvipasture, *Cenchrus setigerus, Prosopis cineraria* to not only build awareness but also to assist those who would like to adapt these new practices and try these new species. Two awareness field days were organized. The first one took place in Rajor Ki Dhani targeting both man and woman. The second field day was dedicated to women farmers on the importance of pasture and its utilization for higher pasture and livestock productivity. A

blog was also written to build awareness to the broader public regarding project activities and efforts. The blog is posted on CRP DS website (http://drylandsystems.cgiar.org/systems-update/improving-dryland-agronomic-practices-one-pastoralist-time). Establishing the site treatments and replications was successful in Azitnagar, Bavarli Jodhpur. Further work will be implemented after receiving the season's rains. A survey was drafted to understand the impact of the project and will be conducted after the monsoon season.

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Introduction

Promoting the growth of spineless cactus in arid areas of India for forage can reduce grazing pressure and degradation by providing new fodder resources and increase incomes. Spineless cactus is known for its remarkable physiological adaptation to water shortage and for its tolerance to dry weather conditions. *Opuntia ficus-indica* can be grown not only as a fodder bank in cultivated fields but also as wind breaks and barriers. The use of cactus cladodes in animal feeding substantially reduces water consumption and can increase in farm output and income. It reduced the dependency on external inputs. Research has shown that lambs fed on straw supplemented by cactus and saltbush grew at a rate of 80 grams per day in Tunisia. Dairy cattle receiving a mixed diet composed of 60% ground cactus cladodes, yielded around 25 liters of milk per day. South African lambs fed on a diet of sun-dried and coarsely-ground cactus cladodes mixed with hay, maize meal, and molasses meal grew at similar rates to those receiving a conventional diet- at a fraction of the cost. The plant can increase incomes not only from reduced costs and increased livestock production but also from alternative income streams as well. The cactus cladodes and fruit can be consumed by humans as well allowing for their sale in various forms. The oil from the seed can also be sold to the cosmetic sector. Extraction of the mucilage from fresh cladodes can form a gelling, emulsifier and fat-replacing agent commonly found in food products such as mayonnaise and candy. The plant is able to generate a high biomass of green forage – ranging from 30 to 250 tons per hectare in semi-arid areas. This reduces the intense pressure that livestock might otherwise exert on scarce water resources and other rangeland plant species.

Goal

To provide green fodder to livestock during the lean season when alternative feed resources are scarce and to promote spineless cactus (*Opuntia ficus-indica)* as an alternative source of green fodder.

Objectives

- To assess survival, growth, fruit yield and biomass production potential of existing *Opuntia ficus-indica* accessions at various locations/accessions through people's participation.
- To select most suitable variety/genotype for fruits/fodder and its dissemination to farmers.

- The development of feeding strategies for sheep, goat and cattle based on optimal use of cactus cladodes.

Past Events Aiming at Promoting Cactus Pear in India

- **In 2010**, 43 germplasm accessions of cactus pear (*Opuntia ficus-indica*) were introduced at CAZRI, Jodhpur.
- **In 2011**: in collaboration with Cactusnet, ICAR and ICARDA, an International Workshop on "Cactus Crop to improve the livelihoods off rural poor and to adapt to climate change in the arid and semi-arid regions in dry areas" was held in Delhi, 25-26 November 2011 at the National Bureau of Plant Genetic Resources (NBPGR).
- **In 2012**, 18 accessions were sent again from Sicily (Italy) to replace the missing accessions. This will enlarge the scope of promotion of this species in suitable agro-climatic set up. In addition, healthy pads were transplanted from the existing cactus plantations at CAZRI HQs (Jodhpur), to the new site at Bhuj.
- **In 2013**, 18 accessions were sent again from Sicily (Italy). The introduced accessions were planted at CAZRI HQs in Jodhpur & Gujrat.

Accomplishments So Far

During the first year of this project (2014/15) the project engaged in a myriad of ways to promote the use of cactus in the dry areas of India including:

Introduction and Assessment of Cactus Pear Condition in Different Agro-Ecological Zones

In 2014/15, through the FAO-ICARDA Cactusnet (http://www.cactusnetwork.org/home.html), cactus accessions were sent from Brazil and Italy to four different partner institutes in four different states of India:

- CAZRI (Central Arid Zone Research Institute) in Rajasthan,
- IGFRI (Indian Grassland and Fodder Research Institute) in Madhya Pradesh,
- CSSRI (Central Soil Salinity Research Institute) in Haryana, and
- UHS Bagalkot (University of Horticulture Sciences Bagalkot) in Karnataka.

CAZRI has two research stations where the accessions are being tested, one in Bhug and the other in Kachchh. IGFRI has more than 21 research sites. Accessions are being evaluated at these research centers for their adaptation to multiple environments in India. See Appendices 8a, b, c, and d for an overview of the accession distribution. Accessions have begun to reproduce cladodes. Initial testing has been conducted on these new accessions in different agro-ecological zones. It is evident in the table below that some cladodes are performing better than others. Such studies are important to promote varieties that are best adapted to the locality. Once the accessions have grown enough to replicate in other research sites they will be distributed to farmers.

Conducting Awareness Field Days

Getting community support is essential for the long term sustainability of the program and to also increase adoption rates through greater visibility. During the first three months of this

project an awareness field day was held at Central Arid Zone Research Institute, Regional Research Station, Bhuj by CAZRI, Jodhpur and KVK, Bhuj on March 3rd 2015. Promotional material for this event was published in the newspaper to encourage greater attendance, see Appendix 9. Farmers that have had prior involvement with CAZRI for the past 3 to 4 years were contacted and an announcement was placed in the local newspaper. The event was attended by 89 farmers from different villages of Kachchh district of Gujrat of which 15 were women. The meeting agenda and attendance can be seen in Appendices 10 and 11 respectively.

The following topics were covered in the field awareness day:

Dr. Devi Dayal, Head, CAZRI-RRS

- Emphasized the utility of thornless cactus for wastelands in Kachchh district.

Dr. Shamsudheen M., Scientist-Soil Science, CAZRI, RRS, Bhuj

- Briefed about the successful growth of over 70 accessions introduced from various countries through ICARDA, Jordan at Bhuj.
- Farmers visited these thornless cactus field (1.5 ha area) established at CAZRI, RRS, Bhuj and appreciated the efforts.

Dr. Suresh Kumar, Head, Division II, CAZRI, Jodhpur and PI, ICAR-ICARDA

Highlighted through video

- Its use as fodder (green and dry) especially in dry season of fodder scarcity.
- The use of young clados for vegetable and pickling are nourishing besides being life support.
- That cactus has tasty fruit that is eaten raw and is a rich source of antioxidants.
- That cosmetics and medicinal constituents derived from its various parts provide income to farmers in Europe and American continents.

Dr. A.S.R. Lalani, Veterinary officer, Sarhad Diary, Kachchh

- Explained how the thornless cactus could improve the animal husbandry scenario of the district.

In view of so many uses and ecological benefits, farmers showed great interest to plant cactus on their own lands. Around 13 farmers demanded the planting materials or cladodes of thornless cactus. The meeting ended with vote of thanks by Sh Sanjay Kumar, Subject Matter Specialist, KVK, Bhuj.

Publications

Scientific article: A paper was presented during the cactus pear congress and published in 2015 by Acta Horticulturae of the International Society for Horticultural Science (ISHS). The citation is as follow:

Roy, M.M., S. Kumar, P.R. Meghwal and A. Kumar. 2015. Prospects of Cactus Introduction for Improving Livelihood in Low Rainfall Regions of India. Proc. VIIIth International Congress on Cactus Pear and Cochineal. Eds.: Inglese et al. Acta Hort. 1067: 239-246, ISHS

Factsheets: Factsheets on agronomic practices and Cactus as a feed resource have also been created (Appendices 12 and 13). These factsheets will assist farmers and extension specialists in adapting these new practices and build awareness among other project stakeholders, such as other government offices, NGOs, grass root organizations, and farmer organizations.

Blog: Blog on utilizing Cactus as a feed resource in India has been published on the field day to create greater visibility and momentum of project efforts (Appendix 14).

Concluding Remarks of Cactus Pear Project

The support for the project efforts has been essential to build the foundation of promoting cactus in the dry areas of India. Spineless cactus pear holds great potential in reducing the forage gap and increasing incomes from the sale of fruit and other products. However such effects are not felt immediately as in depth studies are needed to assess the adaptation to the local environment and to increase awareness of the plant has to be built to that it will be adopted. Initial efforts show great promise and productive varieties are already beginning to be seen and awareness around the project has been received positively by concerned stakeholders. Demand for cactus cladodes is higher from farmers than there are cladodes available. However as replication and testing proceeds this will soon change. Project efforts

are at their inception and will continue and more results will be available in the next project reporting period.

Overall Conclusion

The arid and semi-arid region in the state of Rajasthan India is characterized by scarce, irregular, poorly distributed rainfall and high temperatures. The low nutritive value of the forage from this region is the main obstacle to increasing animal productivity.

Sustainable development of silvipasture systems and *Opuntia ficus-indica* have the potential to reduce feed gaps in the drylands of India and promotion and research of such new techniques is essential to improve livelihoods of pastoralists. The implementation of project activity was delayed considerably due to the fact that the memorandum of agreement (MOU) was signed on the last day of December 2014. As a result, the project has been focusing on building awareness through blogs, factsheets, flyers, and field days. Field days have been met with enthusiasm from farmers and other project stakeholders. Research activities have started for silvipasture to test best bet practices techniques. This latter project has been lucky to have the support of a private farmer who has already shared improved forage cuttings with others through prior work with CAZRI. In addition, the project was able to initiate field trials of cactus accessions with four partner institutions in four different states through the supportive initiatives of these institutes. Knowing that the project was supported by the Indian government has provided essential support and confidence among partners that have made prior project initiatives successful. Now that the MOU is signed and project activities are underway the next reporting period will have even more completed activities to elaborate on.

Appendix 1: Dated MOA Signature Page

(a) All existing Intellectual Property provided for use by the Parties in the collaborative activities under this Agreement ("Background IP") will remain the sole property of the contributing Party. Each Party shall grant the other Party non-exclusive rights to use the contributed Background IP for the purposes of research, development, training and dissemination activities.

(b) All results, including but not limited to data, databases, information, know-how, processes, software, germ plasm or other materials created, discovered or developed during collaborative activities by one or more employees of either Party ("Resulting IP"), will belong to both Parties, and may be used by either Party in research, development, training and dissemination activities. The Resulting IP will be made freely available to other parties as international public goods for non-commercial purposes.

(c) It is agreed that each Party will not license to third parties or sell or commercialize in any form the Resulting IP conceived or made during these collaborative activities without prior written approval of the other Party.

10. INTERNAL AUDIT

ICARDA shall be responsible for any financial audit and as such shall have access to the Program Participant accounts pertaining to the study under this Project only upon written request. The Program Participant shall keep all written records for the period of the Study and for a year after its termination or expiry.

This agreement shall become effective upon signature of both parties and each party shall receive original copy of the signed agreement.

Signed:	Signed:
Name: M. M. ROY	Name: Mahmoud Solh
Title: Director	Title: Director General
Central Arid Zone Research Institute	**International Center for Agricultural Research in the Dry Areas**
Date: 31/12/2014	Date: 20/10/2014

Appendix 2: *Cenchrus setigerus* Flyer



Dryland Systems Solutions

Producing More with Less

Pastoral and Agro-Pastoral Systems

Managing rangelands: promoting sustainable grass/forage species

Birdwood Grass (Cenchrus setigerus): A resilient, drought-tolerant tufted perennial grass suitable for pasture in hot and dry areas

Scientific name: *Cenchrus setigerus*
Common names: bird-wood grass (English), anjan, moda dhaman (India), heskaneit Arabic (Sudan), garbi (Somalia)
Location: Native to East Africa

Drylands are one of the important ecosystems and spread on about 40% of the world's land area. About two billion people get livelihood support from these lands. Rangelands are the dominant land use systems and practiced on about 65% area of the drylands. Developments of drylands are essential to make the peoples more competitive in terms of livelihood to that of well developed areas. Further, development of these areas also helpful in global climate regulation as these lands store approximately 46% of the global carbon share. Several independent silvipastoral models exist for sustaining the livelihood of peoples living in drylands of the world. Silvipastoral systems offer the potential to enhance fodder production for the ever increasing livestock as well as to obtain income from newly afforested areas in short duration.

Cenchrus setigerus is native to East Africa and western Asia and is one of the most drought tolerant perennial tufted grass grows between 30°N and 30°S in western Asia (southern Iran, Yemen, Pakistan and India) and East Africa (Kenya, Tanzania, Eritrea, Ethiopia, Somalia, Sudan, Egypt). It is also found in Australia and South America. It occurs naturally in areas with an average annual rainfall that ranges from 125 mm to approximately 1250 mm, but most commonly between 300 and 600 mm. Common in open dry bush and grassland, it is very tolerant of drought and heat and adapted to arid and semi-arid climates with a long dry season and annual rainfall as low as 200 mm. Optimal temperatures are 30-35°C but it can also survive frost. It can withstand strong winds, low annual rainfall, acute erosion and a nutrient-depleted soil profile. Cenchrus setigerus responds very quickly to light rains but does not respond well to winter rains.

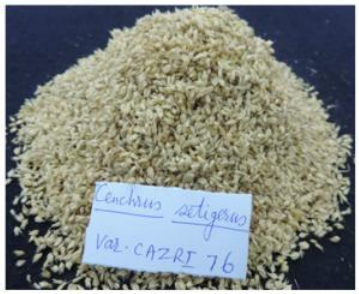
This grass is distributed in hotter and drier parts of India, Pakistan, Mediterranean region, tropical and southern Africa. It is more competitive under the conditions of high temperature, solar radiation and low moisture and more efficient at gathering CO2 and utilizing nitrogen from the atmosphere and recycled N in the soil. It appeared to be superior to buffel grass (*Cenchrus ciliaris*), as it was very hardy, possessing a strong rooting system which enabled it to carry through prolonged drought periods. Even when eaten out the heart of the crown retained its vitality, although the plant would appear to be dead. A few showers of rain will then bring it back into full vigour.

Cenchrus setigerus benefits:

- **Drought tolerant: most drought tolerant perennial tufted grass, survive in annual rainfall ranging from 300 to 600 mm.**
- **Ability to withstand extremes of temperature and frost.**
- **Grow on soil types ranging from sandy, sandy loam, stony and murram and on alkaline soils.**
- **Dry forage yields mostly 1-1.5 t/ha**
- **Forage contains 18.6% CP, 28.3% CF, 11.9% ash, 1.9% EE and 39.3% NFE. The IVDMD and INED values are 57.4 and 54.9 %, respectively.**

Birdwood grass grows in all types of rangelands on sandy, sandy loam, stony and murram (calcium carbonate dominated) soils. Rarely found in fields with stony clay soil and near water courses. It grows luxuriantly in light as well as heavy clay soil. While it prefers light-textured sandy soils, it can be found on gravelly areas and alluvial flats and heavy black clays. It also grows well on alkaline soils and is tolerant to salinity. Best growth of grass observed in well drained sandy-loam soils with pH ranging from 7 to 7.5. This plant requires good fertility, and very responsive to nitrogen (N) and phosphorous (P). The root system is generally less developed than C. ciliaris and hence requires good soil depth.

Sown pasture of C. setigerus on sloppy gravelly land in Nagaur district of Rajasthan



White coloured spikelets of C. setigerus

Purplish coloured spikelets of C. setigerus

Establishment and management

The grass can be established by direct seeding, transplanting seedlings, or by root slips. Its inflorescence is called spike and is 1.0.5-9 cm long and 0.4 to 1.0 cm wide. Spike contain up to 50 spikelets, each spikelets contains one to three caryopses. Caryopses are very small and one gram contains about 350 spikletes. No seed dormancy reported and germination is 10-20% in freshly harvested seeds. in the grass and Seed rate 4-5 kg or root slips 800-1000 kg is recommended for one ha. The crop geometry of 75 cm x 50 cm is found optimum for the grass. For large scale development program, placement of seeds at a 1-2 cm depth in furrows opened with cultivator and also broadcasting just before or at the onset of first effective showers proved to be most effective. Pelleting of seed can also be made by mixing spikletes with tank silt and cow dung. Pelleted seeds germinate better than non-pelleted ones under irrigated conditions whereas unpelleted seeds germinate better under moisture stressed conditions. Maximum germination occurs at 30°C. Direct seeding is done by while mixing the seed with moist sand. Some toxic inhibitors are reported to be present in the seed fuzz, hence soaking of seed in water for about 8-12 hours just before sowing is recommended. One month old seedlings and rooted slips can be also be used for establishment of pasture and transplanted in the prepared field with the onset of rainfall.

Cenchrus setigerus exhibited only one peak of growth during August to October and its performance declined thereafter progressively in Indian sub-continent. The dead biomass proportion which was around 50% until September increased to around 75% in winter and post-winter period gradually. Since the plant can be slow to establish, grazing may need to be delayed 4-6 months after sowing, and up to 9-12 months, depending on establishment conditions. Once established, birdwood grass can stand heavy grazing. To thicken the stand it should be allowed to seed every two to three years. Dry forage yields mostly 1-1.5 t/ha (but ranging from 400-2,000 kg/ha) depending on growing conditions. In India, cutting at ten-day intervals yielded 400 kg DM/ha and cutting at 60-day intervals yielded 2 120 kg DM/ha. At Jodhpur, Rajasthan, average monthly yields per plant of 45 g, 3.2 g and 11.9 g were recorded under 178.8 mm, 92.7 mm and 504.8 mm rainfall respectively. In Northern Australia, it yielded 679 kg DM/ha per year over three years.

Application of nitrogen @ 40 kg/ha or phosphorus @ 20 kg/ha, either singly or in combination, increases yield from 15% to 38% over unfertilized pasture. Removal of weeds from seeded pasture after 3-4 weeks of seeding is essential for good establishment and production. 3-4 cuttings per hectare can be taken in a year from the established pasture. The crop must be cut close to the ground (5 cm above ground) when approximately 15 percent of the plants are flowering for maximum forage yield and quality.

It is highly nutritious grass and considered excellent for pasture in hot, dry areas and is valued for its production of palatable forage and intermittent grazing during droughty periods in the tropics. The grass, fed green, turned into silage, or made into hay is said to increase flow of milk in cattle and impart a sleek and glossy appearance. The nutritive value of grass reached maximum at pre-flowering stage. Its fresh material at the early-bloom stage contained 18.6 per cent crude protein, 28.3 per cent crude fibre, 11.9 per cent ash, 1.9 per cent ether extract and 39.3 per cent nitrogen-free extract. The In Vitro Dry Matter Digestibility (IVDMD) and Energy Digestibility (INED) in the grass is 57.4 and 54.9 %, respectively,

Effective maintenance:

- **Establish by direct seeding, seedlings, or root slips**
- **Plant is slow to establish, grazing may need to be delayed 4-6 months after sowing, and up to 9-12 months, depending on establishment conditions.**
- **To thicken the stand it should be allowed to seed every two to three years.**
- **Once established it can be fed green, grazed, turned into silage, or made into hay**
- **Removal of weeds from seeded pasture after 3-4 weeks of seeding is essential for good establishment and production.**
- **Three to four cuttings per hectare can be taken in a year from the established pasture.**

Rangeland plant factsheets:

This series of flyers is designed to build awareness of sustainable rangeland species among extension workers and those working in the agricultural research and policy sector.

ICAR

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Science for Better Livelihoods in Dry Areas

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Appendix 3: Silvipasture Factsheet

Promoting Sustainable Silvipasture in the Drylands of India

Silvipasture is the practice where livestock and forage is integrated in the agroforestry production system. Traditionally this was common in most of the arid and semi-arid parts of India, particularly in parks. In silvipasture systems, trees or shrubs are planted in rows at a wide spacing creating alleyways where animals can graze in between. The grazing alleys can consist of either annual forage crops or native pasture. In arid environments with rainfall less than 200 mm annually, this is an important practice to improve forage production in places that have high supplementation needs to feed animals. Silvipasture can be used to rehabilitate pastures and prevent erosion. When using drought tolerant species it is ideal for harsh climate conditions for areas with limited rainfall and a high risk of drought. Diversifying forage crops in multi-crop systems can be important for improving diet quality. This practice also extends the grazing season by reducing drought. This is achieved by increased water infiltration in the micro-catchments that shrubs and trees provide. It also improves the organic layer in soil by preventing erosion and contributing organic matter. Increased organic matter improves the water holding capacity of soil. The canopy of shrubs also creates micro-habitats and refuges for native species. Silvipasture presents a way to sequester carbon and still allow for grazing of livestock. As a result it is a system that addresses multiple problems while deriving multiple benefits.

Management:

Silvipasture requires management skills to sustain the system. It constrains traditional mobility and requires protection and periodic maintenance for the system to be sustainable. It takes two years to establish and see the benefits and there are substantial costs to set up this system. Many site characteristics must be taken into consideration when establishing a Silvipasture system, such as; slope, soil characteristics, climate conditions, and which plants to use. While shrubs or fodder trees assist in reducing the feeding gap, shrub and tree fodder can only constitute up to one quarter to one third of the dry matter intake of small ruminants. Thus grass must be provided

or maintained between the rows. Species can vary by locality depending on site characteristics and local knowledge.

Almost all shrub or tree species need to be transplanted except for a few species that can be established through broadcasting or direct seeding. Planting before the rainy season has benefits to allow for root establishment. Roots need to be established and a two year waiting period needs to be implemented prior to grazing to avoid soil compaction from animals that can jeopardize shrub or tree establishment. Selected grass species need to have the ability to adapt to low light, particularly if using tree species, by moderating their efficiency of their photosynthetic apparatus. All selected plant species need to have drought tolerance, easy propagation, high palatability, and the ability to withstand grazing. Rooting structure of both species needs to be taken into account so that there is not competition between species. Plants that have allopathic effects on other plants should not be selected. Some Silvipasture systems grow cash crops such as barely or wheat between the rows that are cut and carried, allowing animals to graze on the stubble and shrubs after harvest. This is another option however sufficient fencing and irrigation is usually needed.

In India, there are many commonly planted trees that can be cut and used for fodder or fuel. Commonly planted trees that are used for fuel and fodder in the arid and semi-arid areas include *Ailanthus excelsa*, *Acacic nilotica, Prosopis cineraria, Ziziphus nummularia, Z. mauratiana, Tecomella undulata, and Dalbergia sissoo* amongst others. The trees *Prosopis cineraria, Ziziphus nummularia,* and *Tecomella undulata* are commonly planted in arid zones with low rainfall while *Dalbergia sissoo* is grown in the irrigated areas of arid zone of India. The growth of *P. cineraria* is very slow under the rainfall zone of less than 200 mm and takes about 20 years to reach a desirable height. Under alluvial soils and higher rainfall zones (300-450 mm) it grows well and is able to produce 40-50 kg dry leaves at 12-15 years of age. The tree can withstand heavy lopping and browsing. *Z. nummularia* can regenerate through root suckers and can regenerate even after being felled. Aside from creating leaf fodder *Z. nummularia* can yield 3-5 kg of fruit per bush even while growing under rainfall conditions of 150-250 mm per year. Fruit trees are also often cultivated such as *Cordia myxa*, *Ziziphus mauratiana, Phyllanthus emblica* and *Phoenix dactylifera*, but irrigation may be necessary depending on the species.

Appendix 4: *Prosopis cineraria* Factsheet

Dryland Systems Solutions

Producing More with Less

Scientific name: *Prosopis cineraria*
Common names: Ghaf (Arabic), Khejri (Rajasthan), Kandi (Sindh, Pakistan), Gandasein (Burmese), Sami/ Shami (Shanskrit) and Lunu andara (Sinhala, Srilanka)
Location: Native to arid portions of Western and South Asia such as the Arabian and Thar Deserts

Pastoral and Agro-Pastoral Systems

Agroforestry systems: promoting sustainable forage production species

Khejri (*Prosopis cineraria*): A marvel tree for the agroforestry in arid and semi-arid ecosystem

Drylands cover approximately 40% of the world's land area, and support two billion people. Rangelands and arable crops practiced on 65% and 25% of the total reported area. Land degradation is the common phenomenon in drylands. In recent past the process of degrading natural resource base is increased many fold due to rapid increase in human and animal population and aberration in climatic events. Drylands are more vulnerable to impacts of climate change than the irrigated areas due to prevailing, environmental, economic and political reasons. Application of sustainable land management practices such as use of land according to its capability and growing of perennial herbs with the woody perennials could help in recovering and rehabilitation of land, water and vegetation in arid regions. The result: improvement in the livelihood security of rural communities and restoration of natural resources.

Khejri (*Prosopis cineraria*) is an important tree of the desert ecosystem and played important role in the lives of people. It is the state tree of Rajasthan (India) and national tree of the United Arab Emirates. It is one of the most drought tolerant tree species found in the desert ecosystem and inhabits dry, arid areas where annual rainfall averages less than 500 mm. In areas of its natural distribution, the climate is characterized by extremes of temperature. It is capable of lodging roots 30 metres into the ground and accessing water obscured from the grasps of animals and other plants alike. Withstanding great variation in temperatures, it easily copes with summer heat in the 50°C range and winter nights that can bottom at around 0°C. The tree is able to withstand the hottest winds and the driest season, and remains alive when other plants would succumb.

In India, its density varies from 5 to 80 trees per ha. The rainfall belt between 250 and 400 mm shows highest density. Its density decreases on both sides of this rainfall zone. It is a slow growing tree and takes 10 to 15 years to mature in 200 – 300 mm rainfall zone and 20 years in 100 – 200 mm rainfall zone. Slow growth of the aerial part is one of the adaptation of this tree. Khejri tries to establish itself first with its strong root system and then allows the top growth. This deeper root system help this plant to withstand the drought successfully. The tree is small to medium in size, can withstand extremes of temperature up to 50°C and less than 100 mm rainfall. Hence it became an integral part of the traditional agriculture and the lifeline of the desert inhabitants of Rajasthan and provides much needed fuel, fodder and vegetable to the farmers.

Prosopis cineraria benefits:

- **Drought tolerant: Long tap root system, survive in annual rainfall ranging from 100 to 500 mm.**
- **Ability to withstand extremes of temperature up to 50°C and less than 100 mm rainfall.**
- **Grow on soil types ranging from sandy loam to clay loam and flat plains to sand dunes.**
- **A moderate sized tree yields about 45 kg of dry leaf fodder that contain 93.2% dry matter, 92% organic matter, 16.8% crude protein and 49.3% TDN.**

Although it has a wide ecological amplitude, its optimum density (150-200 per ha) and vigour is found in 300-400 mm rainfall. It is a tree of the plains or gently undulating ground and ravine country and seldom extends into the hills. *Prosopis cineraria* is found on soil types ranging from sandy loam to clay loam and flat plains to sand dunes, but grows best on alluvial soils consisting of various mixtures of sand and clay. Older and younger alluvial plains are the two habitats preferred by khejri. Alluvial plains with sandy loam soils invariably support more trees. It is common on moderately saline soils, but quickly dries out where the soil is very saline. Because of its capacity to avail perched water and to absorb moisture from rains through its foliage, it can grow in the extremely arid tracts (100 mm rainfall).

Khejri based parkland agroforestry practiced with rainfed crops in Rajasthan

Lopping provides both Loong and firewood

Khejri plant infected with fungus Gonoderma lucidium fungus, cause of mortality

Silvipastoral Management

Khejri tree does not compete for moisture and nutrients with crops. It improves soil fertility through fixing of atmospheric nitrogen, adding organic matter through leaf litter decomposition and increasing soil moisture in the rhizosphere. It coppices readily and can withstand heavy lopping/browsing. Owing to all these, khejri is compatible with all arable crops and pasture grasses. The tree boosts the growth and productivity of the companion plants. The most widely practiced systems is the *Prosopis cineraria* parklands in Rajasthan and other western parts of India. Rainfed crops (millets and legumes) are grown during the autumn and irrigated crops (wheat, barley, mustard, cumin etc.) are grown during spring. Yield of rainfed crops, pearl millet, sorghum, mung bean, moth bean and cluster bean grown within 5-10 m radius around the mature tree recorded two to three times more grain yield than the crops growing adjacently but away from trees in rainfall zone of 300-500 mm.

The silvipastural experiments conducted at CAZRI, Jodhpur revealed that dry matter yields of range grasses under *Prosopis* was highest, 2.3 t/ha compared with other trees. *Prosopis cineraria* is an important source of top feed during lean months from December to June. A moderate sized tree yields about 45 kg of dry leaf fodder locally known as 'loong'. The dry leaves contain 93.2% dry matter, 92% organic matter and 16.8% crude protein. All trees are lopped for foliage (loong) in a systematic manner during November and December each year. The lopped trees virtually remain dormant during winter and sprout by mid-February. This reduces the crown cover and improves the penetration of sun light required for growing crops. In June to July, the sown kharif crop and the tree crown grow simultaneously. The tree crown assumes its full foliage by the end of September when the agricultural crops start maturing. The crop and tree do not compete with each other as annual crops draw their moisture and nutrients from the top 50-60 cm of soil, whereas the effective root system of the tree is below this depth. Through experience, farmers have realized its usefulness and learnt that it does not adversely affect crop yields but actually improves grain yield and forage biomass production.

Mortality Management

Recently, heavy mortality of khejri in the Nagaur, Jhunjhunu, Jodhpur, Churu, Sikar and Jaipur districts of Rajasthan have raised an alarm in the all walks of the society. Closed observations from the CAZR, Jodhpur revealed that the mortality was more in the old trees > 50 years or so and the casual organisms were *Acanthophorus serraticornis*, *Derolus discicollis* beetles and white rot fungus (*Ganoderma lucidum*). The insect damages the older roots and the fungus grows on these roots which impaired nutrient and water transport system of the trees. Excessive agricultural mechanization also causes problems; it does not allow the slow growing khejri saplings time to take root. Many scientific explanations correlated the mortality with declining water table, but there is nothing conclusive so far. Scientists of CAZRI, Jodhpur recommended integrated management for the rejuvenation of dying tree. Application of phorate @ 20 g/tree and *Trichoderma harzianum* preincubated in goat manure (1:40 g)/tree is recommended for control of insect and fungus.

Effective maintenance:

- **The tree is ready for lopping during the 8th year of its life in the 350-400 mm rainfall zone**
- **Prune the tree in the month of Oct-Nov for better quality leaves.**
- **In rainfall zone (400-500 mm) pruning can be done every year while in low rainfall areas it can be done once in every two year.**

ICARDA
Science for Better Livelihoods in Dry Areas

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Appendix 5: Survey Questionnaire for Impact Evaluation of Silvipasture Systems

Project 9 Baseline Survey

Instructions: Please circle the corresponding answer or fill in the blank.

How much rangeland do you own or able to practice silvipasture? ____ Ha

Prior to this project to you practice Silvipasture? **Yes** **No**

Silvipasture is the practice of cultivating forage grasses in combination with shrub and tree species.

Prior to this project have you cultivated buffel grass or mode dhaman grass (*Cenchrus ciliaris* or *Cenchrus setigerus*)?

Yes **No**

Prior to this project have you cultivated Khejri or the Loong Tree (*Prosopis cineraria*)?

Yes **No**

How many animals do you lose annually?

Less than 25% **Between 25% and 49%** **50% or greater**

Final Evaluation

Instructions: Please circle the corresponding answer.

How much rangeland do you own or able to practice silvipasture? ____ Ha

Do you practice Silvipasture as promoted by the project? **Yes** **No**

Silvipasture is the practice of cultivating forage grasses in combination with shrub and tree species.

Do you currently cultivate buffel grass or mode dhaman grass (*Cenchrus ciliaris* or *Cenchrus setigerus*)?

Yes **No**

Do you currently cultivate Khejri (*Prosopis cineraria*)?

Yes **No**

If no to any of the above, what are the reasons that are preventing you from adopting these practices?

_____
_____
_____

How many animals do you lose annually?

Less than 25% **Between 25% and 49%** **50% or greater**

Has the body condition of your livestock improved since the implementation of this project?

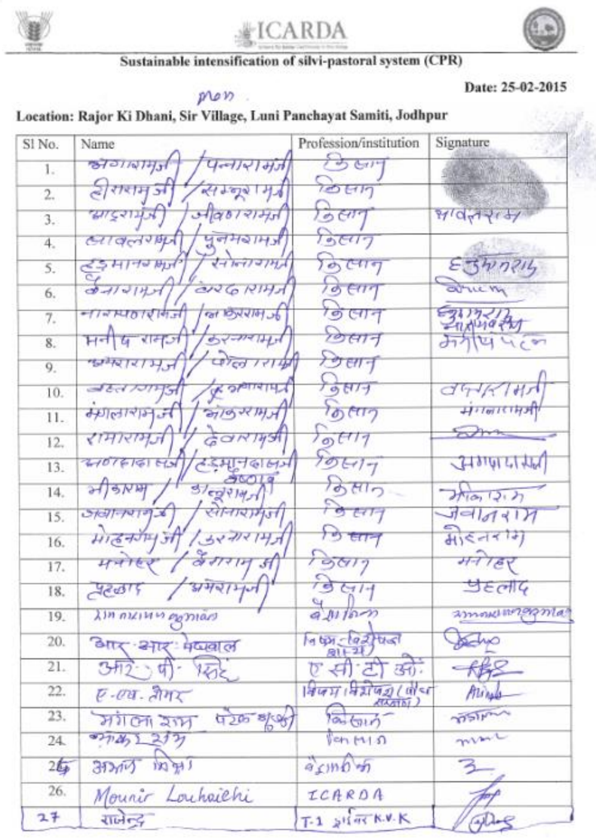
Yes **No**

Have you increased the number of your livestock as a result of this project?

Yes **No**

Appendix 6: List of Participants in Rajore Ki Dhani Field day

(Male and Female)



ICARDA

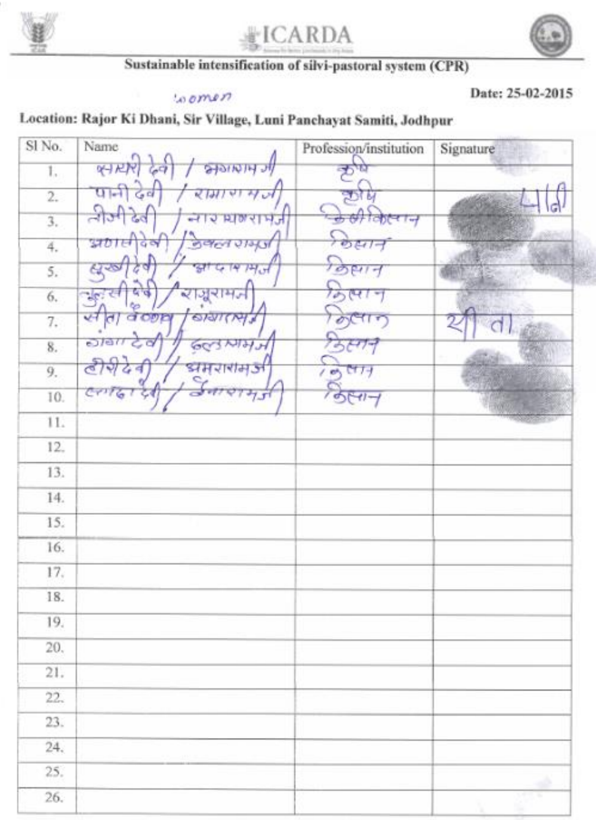
Sustainable intensification of silvi-pastoral system (CPR)

Date: 25-02-2015

men

Location: Rajor Ki Dhani, Sir Village, Luni Panchayat Samiti, Jodhpur

Sl No.	Name	Profession/institution	Signature
1.	भगारामजी / पन्नारामजी	किसान	
2.	हीरारामजी / सम्भूरामजी	किसान	
3.	भादरामजी / जीवणारामजी	किसान	भावतराम
4.	लावलरामजी / पुनमारामजी	किसान	
5.	हनुमानरामजी / सोनारामजी	किसान	हनुमानराम
6.	केनारामजी / बरदारामजी	किसान	[illegible]
7.	नारायणारामजी / [illegible]	किसान	[illegible]
8.	मनीष रामजी / करनारामजी	किसान	मनीष पटेल
9.	अमरारामजी / पोलारामजी	किसान	
10.	वहतारामजी / कुम्भारामजी	किसान	वहतारामजी
11.	मंगलारामजी / भाकरामजी	किसान	मंगलारामजी
12.	रामारामजी / देवारामजी	किसान	[illegible]
13.	जगदीशदासजी / हनुमानदासजी वैष्णव	किसान	जगदीशदासजी
14.	भीकाराम / कालूरामजी	किसान	भीकाराम
15.	जवानारामजी / सोनारामजी	किसान	जवानराम
16.	मोहनरामजी / उरजारामजी	किसान	मोहनराम
17.	मनोहर / केनाराम जी	किसान	मनोहर
18.	प्रहलाद / अमेरामजी	किसान	प्रहलाद
19.	Ram niwas kumawat	वैज्ञानिक	[illegible]
20.	आर. आर. मेघवाल	निदेशक विशेषज्ञ (आत्मा)	[illegible]
21.	आर. पी. सिंह	ए सी टी ओ	[illegible]
22.	ए. एच. तोमर	[illegible]	[illegible]
23.	मंगला राम पटेल	किसान	[illegible]
24.	[illegible] राम	किसान	[illegible]
25.	अशोक मिश्रा	वैज्ञानिक	[illegible]
26.	Mounir Louhaichi	ICARDA	[illegible]
27	राजेन्द्र	T-1 [illegible] K.V.K	[illegible]



ICARDA

Sustainable intensification of silvi-pastoral system (CPR)

Date: 25-02-2015

women

Location: Rajor Ki Dhani, Sir Village, Luni Panchayat Samiti, Jodhpur

Sl No.	Name	Profession/institution	Signature
1.	सायरी देवी / भगारामजी	कृषि	
2.	पानी देवी / रामारामजी	कृषि	पानी
3.	तीजी देवी / नारायणरामजी	खेती किसान	
4.	भगवानी देवी / केवलरामजी	किसान	
5.	सुखी देवी / भादरामजी	किसान	
6.	तुलसी देवी / राजूरामजी	किसान	
7.	सीता वैष्णव / बाबूलालजी	किसान	सीता
8.	गंगा देवी / दलारामजी	किसान	
9.	हीरी देवी / अमरारामजी	किसान	
10.	लाडा देवी / केनारामजी	किसान	
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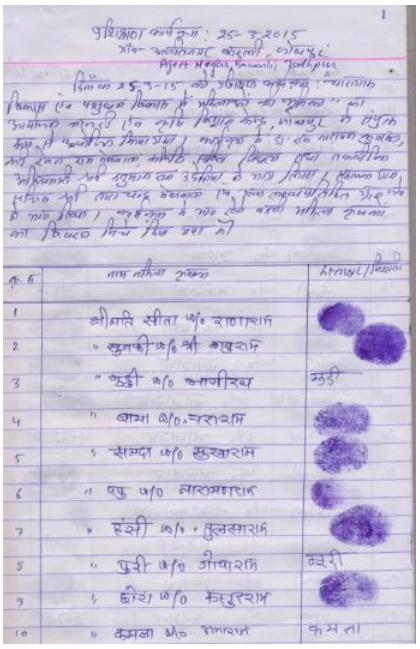
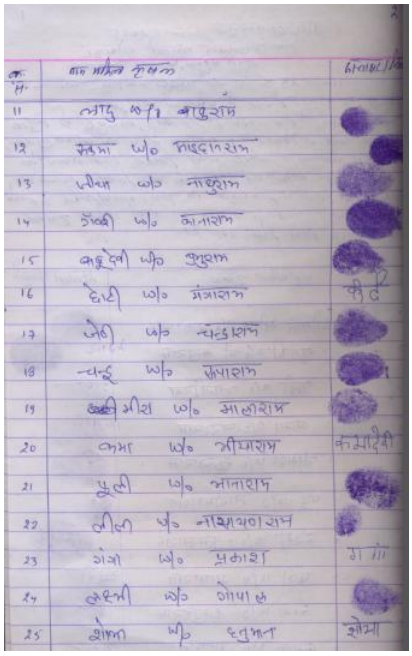
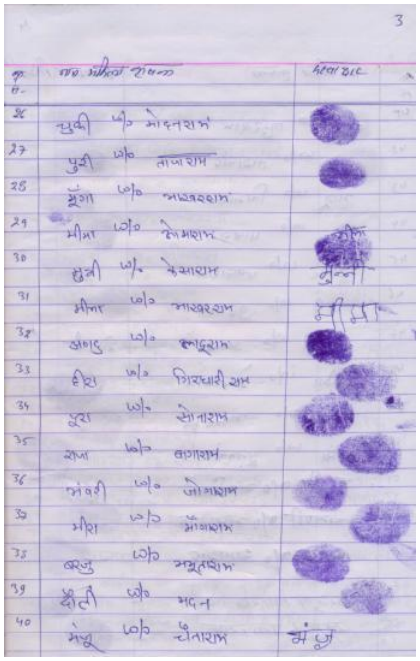
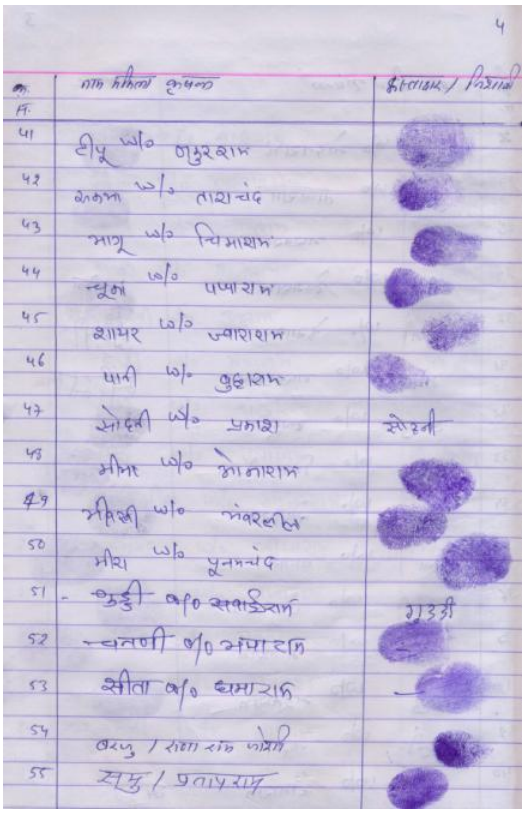
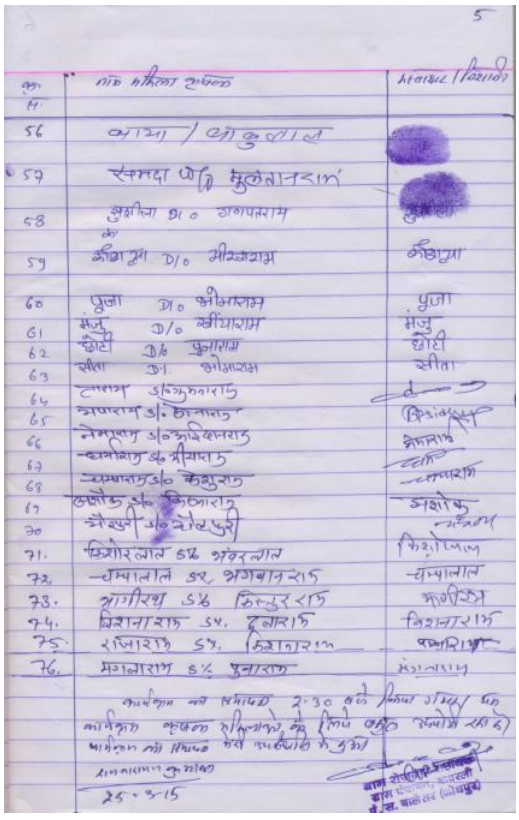
Appendix 7: List of Participants Women Training











Appendix 8a: CAZRI, Bhuj and Kachchh

Accession Name	Origin	Pads per Accession
Morado	Italy	3
Roly Poly	Italy	3
White San Cono	Italy	2
Zastron 4	Italy	3
Yellow San Cono	Italy	2
Trunzara Red Bronte	Italy	3
Algerian	Italy	3
Red San Cono	Italy	3
Seedless Roccapalumba	Italy	3
Red Roccapalumba	Italy	3
White Roccapalumba	Italy	3
Yellow Roccapalumba	Italy	3
Yellow Santa Margherita Belice	Italy	3
White Santa Margherita Belice	Italy	3
Red Santa Margherita Belice	Italy	3
Gialla Roccapalumba	Italy	4
Trunzara Bianca-San Cono	Italy	1
Rossa Roccapalumba	Italy	3
Bianca Roccapalumba	Italy	2
Seedless Roccapalumba	Italy	2
Spineless	Italy	2
Seedless Santa Margherita Belice	Italy	2
Trunzara Rossa Bronte	Italy	3
Trunzara Gialla Bronte	Italy	2
Trunzara Bianca Bronte	Italy	2
Trunzara Gialla San Cono	Italy	2
Trunzara Bianca San Cono	Italy	2
Rossa San Cono	Italy	2
Gialla San Cono	Italy	2
Bianca San Cono	Italy	2
Palma Grande	Brazil	1
Palma redonda	Brazil	1
Palma miuda ou doce	Brazil	1
IPA 20 ou clone 20	Brazil	1
IPA Sertania ou baiana	Brazil	1
Orelha de onca	Brazil	2
Orelha de elefante mexicana	Brazil	1
Orelha de elefante africana	Brazil	1
F8- Forrageira 8	Brazil	1
COPENA F1	Brazil	1

COPENA V1	Brazil	1
IPA-90-18	Brazil	1
IPA-90-73	Brazil	1
IPA-90-92	Brazil	1
IPA-90-111	Brazil	1
IPA-90-115	Brazil	1
IPA-90-156	Brazil	1
Palma azul	Brazil	1
Additional - 1258	Brazil	1
Mexico Folder-1278	Brazil	1
Mexico vegetable	Brazil	1
Mamillion fodder	Brazil	1
Mexico unknown	Brazil	1
Jalpa	Brazil	1

Appendix 8b: Indian Grass and Fodder Research Institute (IGFRI)

Accession Name	Origin	Pads per Accession
Trunzara Gialla Bronte	Italy	3
Rosaa San Cono	Italy	1
Bianca San Cono	Italy	1
Palma Redonta	Brazil	3
Palma miuda ou doce	Brazil	4
IPA 20 ou clone 20	Brazil	10
IPA Sertania ou baiana	Brazil	10
Orelha de onca	Brazil	44+31
Orelha de elefante africana	Brazil	1
F 8-Forrageira 8	Brazil	12+8
COPENA F1	Brazil	21+23
COPENA V1	Brazil	7
IPA – 90 - 18	Brazil	2
IPA – 90 - 73	Brazil	6
IPA – 90 - 92	Brazil	3
IPA – 90 - 111	Brazil	3
IPA – 90 - 156	Brazil	3
Palma azul	Brazil	3
Additional - 1258	Brazil	4
Mexico Folder - 1278	Brazil	4
Mexico Vegetable	Brazil	2
Mexico unknown	Brazil	14+15

Appendix 8c: Central Soil Salinity Research Institute (CSSRI)

Accession Name	Origin	Pads per Accession
Gialla Roccapalumba	Italy	2
Trunzara Bianca- San Cono	Italy	1
Rossa Roccapalumba	Italy	1
Bianca Roccapalumba	Italy	1
Seedless Roccapalumba	Italy	1
Spinless	Italy	1
Seedless Santa Margherita Belice	Italy	1
Trunzara Rossa Bronte	Italy	1
Trunzara Gialla Bronte	Italy	1
Trunzara Bianca Bronte	Italy	1
Trunzara Gialla San Cono	Italy	1
Trunzara Bianca San Cono	Italy	2
Rossa San Cono	Italy	1
Gialla San Cono	Italy	1
Bianca San Cono	Italy	1
Palma grande	Brazil	1
Palma redonda	Brazil	1
Palma miuda ou doce	Brazil	1
IPA 20 ou clone 20	Brazil	1
IPA Sertania ou baiana	Brazil	1
Orelha de onca	Brazil	2
Orelha de elefante maxicana	Brazil	1
Orelha de elefante africana	Brazil	1
F 8 - Forrageira 8	Brazil	1
COPENA F1	Brazil	1
COPENA V1	Brazil	1
IPA - 90 -18	Brazil	1
IPA - 90 -73	Brazil	1
IPA - 90 -92	Brazil	1
IPA - 90 -111	Brazil	1
IPA - 90 -115	Brazil	1
IPA - 90 -156	Brazil	1
Palma azul	Brazil	1
Additional - 1258	Brazil	1
Mexico Folder - 1278	Brazil	1
Mexico vegetable	Brazil	1
Mamillon fodder	Brazil	1
Mexico unknown	Brazil	1
Jalpa	Brazil	1

Appendix 8d: University of Horticultural Sciences, Bagalkot (UHS BAGALKOT)

Accession Name	Origin	Pads per Accession
Morado	Italy	2
Roly Poly	Italy	2
White San Cono	Italy	1
Zastron	Italy	1
Yellow San Cono	Italy	2
Trunzara Red Bronte	Italy	1
Algerian	Italy	1
Red San Cono	Italy	2
Seedless Roccapalumba	Italy	2
Red Roccapalumb	Italy	2
White Roccapalumba	Italy	1
Yellow Roccapalumba	Italy	1
Yellow Santa Margherita Belice	Italy	1
White Santa Margherita Belice	Italy	1
Red Santa Margherita Belice	Italy	1
Gialla Roccapalumba	Italy	4
Trunzara Bianca- San Cono	Italy	2
Rossa Roccapalumba	Italy	3
Bianca Roccapalumba	Italy	1
Seedless Rocccapalumba	Italy	2
Spinless	Italy	3
Seedless Santa Margherita Belice	Italy	2
Trunzara Rossa Bronte	Italy	3
Trunzara Gialla Bronte	Italy	3
Trunzara Bianca Bronte	Italy	3
Trunzara Gialla san cono	Italy	3
Trunzara Bianca San Cono	Italy	3
Rossa San Cono	Italy	3
Gialla San Cono	Italy	3
Bianca San Cono	Italy	3

Appendix 9: Cactus Awareness Day Promotion

કચ્છમિત્ર

ગુરુવાર ■ તા. ૦૫/૦૩/૨૦૧૫ | પાના ૧૬ ■ કિંમત : રૂા. ૪

સંવત : ૨૦૭૧ ■ ફાગણ સુદ ૧૫ ■ વર્ષ : ૬૮ ■ અંક : ૧૯૧ | ફોન : ૨૫૨૦૮૯ થી ૯૨ ■ ફેક્સ : ૨૫૦૨૭૧/૨૫૨૦૮૭

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'કાઝરી' દ્વારા ખાસ સીરિયાથી મંગાવીને જેનું સંવર્ધન-ઉછેર કાર્ય હાથ ધરાયું છે તે કાંટા વિનાના થોરને નિહાળી રહેલા જિલ્લાના ખેડૂતો.

સીરિયાના થોરથી કચ્છની કાયાપલટ

ભુજ, તા.૪ : કચ્છની આબોહવા અને જમીનની વિવિધતા ઉપરાંત પાણીની ઓછી ઉપલબ્ધતાને ધ્યાને લેતાં કાંટા વગરના થોરની વાવણી જિલ્લાની કૃષિ વ્યવસ્થાની કાયાપલટ કરી શકવા સક્ષમ છે. આ પ્રકારના થોર ભારતમાં થતા નથી પરંતુ પહેલી વખત કેન્દ્રીય શુષ્ક વિસ્તાર અનુસંધાન કેન્દ્ર (કાઝરી) દ્વારા સીરિયા, જોર્ડન અને ઝાઝિલ જેવા દેશોમાંથી આ થોરને મંગાવીને ફુકમા ખાતેના તેના કેન્દ્રમાં વિકસિત કર્યો છે. આ થોર અંગે ખેડૂતોમાં જાગૃતિ કેળવાય એ માટે કાઝરી દ્વારા પ્રત્યક્ષ નિદર્શનનો કાર્યક્રમ યોજાયો હતો જેમાં ૧૫ મહિલા ખેડૂત સહિત ૮૯ ખેડૂતોએ ભાગ લીધો હતો અને કાંટા વિનાના થોરના ઉત્પાદનને આગળ વધારવામાં રસ બતાવ્યો હતો.

કાઝરી પરિસરમાં આઈસીએઆર-

કાંટા વિનાના થોરનું 'કાઝરી'માં નિદર્શન : ૮૯ ખેડૂતોએ રસ બતાવ્યો

આઈસીએઆરડીએના સહકારમાં યોજાયેલા આ કાર્યક્રમમાં કાઝરીના વડા ડો. દેવીદયાલે કહ્યું કે જિલ્લામાં પડતર ભૂમિ વિશાળ પ્રમાણમાં ઉપલબ્ધ છે ત્યારે કાંટા વિનાનો થોર પર્યાવરણ રક્ષક બનવાની સાથે કચ્છમાં પ્રવર્તતી ચારાની ખેંચને પણ નિવારી શકે તેમ છે કેમકે આ પ્રકારનો થોર પશુઓ માટે પોષક ચારો છે.

આયોજક સંસ્થાના ભૂમિ વૈજ્ઞાનિક ડો. સમસુદીન મંગલસરાયે કાંટા વિનાના થોર અંગે હાલમાં ચાલતા અભ્યાસની માહિતી આપી હતી.

જોધપુર કાઝરીના વડા (ડિવિઝન-૨) ડો. સુરેશ કુમારે લીલા અને સૂકા ચારા તરીકે થોરની ઉપયોગીતા જણાવી હતી.

સરહદ ડેરીના પશુ ચિકિત્સા અધિકારી ડો.કે.પી. આર. લાલાણીએ પણ કાંટા વિનાનો થોર કચ્છમાં પશુપાલનના અર્થતંત્રને બદલવા સક્ષમ હોવાનું કહ્યું હતું.

કોટડાના મહિલા ખેડૂત અમૃતબેન પટેલ, શિકારપુરના છગનભાઈએ પ્રતિભાવ આપ્યો હતો. કેવીકે કાઝરીના સંજયકુમારે આભારવિધિ કરી હતી.

ગાંધીધામ તાલુકામાં ત્રણને બદલે એક જ પી.એચ.સી. !

સ્વાઇન ફલુના ૬૦ કેસ ધરાવતા તાલુકામાં આરોગ્ય માળખું તદ્દન નબળું હોવાથી સત્વરે વધુ સારવાર કેન્દ્રો શરૂ કરવાની થઇ રહેલી માગણી

ઉદય અંતાણી દ્વારા

ગાંધીધામ, તા. ૪ : સમગ્ર કચ્છની સાથોસાથ ગાંધીધામ કંડલા સંકુલમાં પણ સ્વાઇન ફ્લુના તાવમાં અનેક લોકો સપડાયા છે. અલગ તાલુકો અસ્તિત્વમાં આવ્યાને ૧૫ વર્ષ જેટલો સમયગાળો વીતી ગયો છતાં આરોગ્ય ક્ષેત્રે માળખાંગત સુવિધાની પરિસ્થિતિ છે છતાંય નથી જેવી છે. તાલુકાના નવ ગામડાં વચ્ચે માત્ર એક જ પ્રાથમિક આરોગ્ય કેન્દ્ર છે, તેમાંય અગવડોની ભરમાર છે.

આ અંગે સત્તાવાર સાધનો પાસેથી જાણવા મળતી વિગતો મુજબ સરકારના ધારાધોરણો પ્રમાણે ૩૦ હજારની વસ્તીમાં એક પ્રાથમિક આરોગ્ય કેન્દ્ર હોવું જોઇએ જ્યારે ગાંધીધામ તાલુકાના ગામડાઓની ૮૫,૦૦૦ જેટલી વસ્તી છે તેની સામે માત્ર એક જ પ્રાથમિક આરોગ્ય કેન્દ્ર કિડાણામાં કાર્યરત છે. આ પ્રાથમિક આરોગ્ય કેન્દ્ર તાલુકાના ૯ ગામડાઓને લાગુ પડે છે. પરંતુ કિડાણાથી ભારાપર અંતરજાળ નજીક પડે જ્યારે ખારીરોહર, મીઠીરોહર, પડાણા, શિણાય, ગળપાદર સહિતના ગામડાના રહેવાસીઓને કિડાણા ઘણું દૂર પડે તેમ છે. જેથી આ ગામડાઓના તમામ રહેવાસીઓને સારવાર માટે રામબાગ હોસ્પિટલનો જ સહારો લેવો પડે. કિડાણાના પ્રાથમિક આરોગ્ય કેન્દ્રમાં ખાટલે મોટી ખોડ પોતાનું મકાન નથી. હાલ ભાડાના મકાનમાં બે રૂમોમાં આ કેન્દ્રનું ગાડું ગબડાવવામાં આવે છે. આરોગ્ય કેન્દ્રમાં એક ડોક્ટર, મેલ-ફીમેલ સુપરવાઇઝર, લેબ ટેકનિશીયન, ફાર્માસીસ્ટ, વોર્ડ બોય અને નર્સ સહિતના સ્ટાફનું મહેકમ હોય છે જેની સામે નવ ગામડાઓને સાંકળતા આ પ્રાથમિક આરોગ્ય કેન્દ્રમાં નર્સ, લેબ ટેકનિશીયન અને મેલેરિયા વર્કરની ત્રણ મહત્ત્વની જગ્યાઓ લાંબા સમયથી ખાલી પડી છે. એમ્બ્યુલન્સ જૂના મોડેલની ડબ્બા જેવી હાલવાઇ છે જે માત્ર ચાર કે પાંચ કિ.મી.ની એવરેજ માંડ આપે છે.

તાલુકાના ગામડાઓની ૮૫,૦૦૦ની વસ્તીને ધ્યાનમાં લેવાય તો ગાંધીધામ તાલુકામાં એક નહીં પરંતુ ત્રણ પ્રાથમિક આરોગ્ય કેન્દ્રની તાતી જરૂરિયાત છે. હાલ કિડાણાના કેન્દ્રમાં દરરોજના ૪૦થી ૫૦ જેટલા દર્દીઓની તપાસ થતી હોવાનું સૂત્રોએ જણાવ્યું હતું. આરોગ્ય કેન્દ્ર માટે મકાન બાંધવા સરકાર દ્વારા ૯૮ લાખ મંજૂર કરાયા છે પરંતુ તેની અમલવારી ક્યારે થશે તે હજુ સુધી કાંઇ નક્કી નથી. તાલુકાના સાત સેન્ટરોની પણ એવી જ હાલત છે.

બે સબ સેન્ટર સિવાય પાંચ સબ સેન્ટરો ભાડાના મકાનમાં છે તો કેટલાક મકાનો તોડવા પડે તેવા જર્જરિત છે. સરકારના નિયમ મુજબ પાંચ હજારની વસ્તીએ એક સબ સેન્ટર હોવું જોઇએ જેની સામે ગાંધીધામના પ્રત્યેક ગામડાની સરેરાશ વસ્તી ૧૦ હજારથી વધુ છે. જેથી એક જણનો સ્ટાફ કેટલે પહોંચે ? તે સવાલ છે. કિડાણાના તબીબને ગાંધીધામના ત્રણ અર્બન હેલ્થ સેન્ટરનો ચાર્જ સોંપી દેવાયો હોવાથી કામગીરીના ભારણથી પ્રાથમિક આરોગ્ય કેન્દ્રની કામગીરી ખોરંભે ચડતી હોવાનું જાણકારોએ જણાવ્યું હતું.

કિડાણા ગામમાં આવેલું પ્રાથમિક આરોગ્ય કેન્દ્ર.

હાલ ગાંધીધામ તાલુકામાં સ્વાઇન ફ્લુના ૬૦ જેટલા પોઝિટિવ કેસ નોંધાયા છે. હાલ આરોગ્ય વિભાગની ટીમ દ્વારા સર્વે કરી જ્યાં શરદી, ઉધરસ, તાવના દર્દી હોય તેને પ્રાથમિક સારવાર અપાય છે. ગાંધીધામમાં ચાર મોટી હોસ્પિટલો, ૩૫ જેટલા સ્ત્રીરોગ નિષ્ણાત, સાત જેટલા એમ.ડી., પાંચ જેટલા સર્જન, ૧૦ બાળરોગ નિષ્ણાત અને ફેમિલી ફિઝિશીયનોની ખાનગી હોસ્પિટલો કાર્યરત છે.

તાલુકો અસ્તિત્વમાં આવ્યા બાદ આરોગ્ય ક્ષેત્રે માળખાંકીય સુવિધાઓ વિકસાવવાની દિશામાં જવાબદાર તંત્રોએ કોઇ કાર્યવાહી કરી ન હોવાનું અત્યારની પરિસ્થિતિ પરથી ફલિત થાય છે. એક પી.એચ.સી.ની દરખાસ્ત કરાઇ છે પરંતુ હજુ સુધી આગળ વધી ન હોવાનું સૂત્રોએ જણાવ્યું હતું. આ દિશામાં સરકાર ત્વરાએ ઘટતી કાર્યવાહી કરે તે સમયની માંગ હોવાનું જાણકારો જણાવી રહ્યા છે.

ભુજ સુધરાઇમાં છૂટા થયેલા કામદારો પાસે હવે ઉઘરાણા !

વકીલની ફી માટે અમુક તત્ત્વોએ ફાળો માગવાની કચેરીમાં ચર્ચા

ભુજ, તા. ૪ : આર્થિક બોજ ઘટાડવાના પગલાંરૂપે શહેર સુધરાઇના ફીક્સ પગાર ધરાવતા ૮૭ કર્મચારીઓને છૂટા કરવાના નિર્ણય બાદ વહેતી ગંગામાં હાથ ધોઇ લેવા અમુક કર્મચારીઓ સક્રિય થયા છે, એટલું જ નહીં વકીલની ફી પેટે ઉઘરાણા શરૂ કરાયાં હોવાનું કચેરીના વર્તુળોએ કહ્યું હતું.

કચેરીના વર્તુળોએ કહ્યું હતું કે, કોન્ટ્રેક્ટ બેઝના કર્મચારીઓને સામાન્ય રીતે કાયદાકીય રક્ષણ નથી હોતું છતાંયે કેટલાક કર્મચારીઓએ છૂટા થયેલાઓનો સંપર્ક કરી રૂા. ૨-૨ હજારનો ફાળો આપવામાં આવે તો વકીલને મળીને કાનૂની કાર્યવાહી કરી શકાય.

કચેરીના વર્તુળોએ કહ્યું હતું કે, ઉઘરાણા કરનાર તત્ત્વોનું કેટલું ઉપજશે તેનાથી અજાણ એવા અમુક છૂટા થયેલા ગભરૂ કામદારો નોકરી માટે કાંઇપણ કરી છૂટવા તૈયાર થયા છે તો કેટલાક સિનિયરોની સલાહ લેવા માંડ્યા છે કે ફાળો દેવાય કે કેમ ? આમ આ હવે ફાળાએ સુધરાઇમાં ચર્ચા જગાવી છે.

ભુજ સુધરાઇએ ૧૦૦ વેપારીને નોટિસ પાઠવી

ભુજ, તા. ૪ : નગરપાલિકા દ્વારા બે દિવસમાં જ શહેરની સરાફ બજાર, ગોપિયાણી શેરી સહિતના વિસ્તારમાં શોપ લાયસન્સ, વ્યવસાયવેરા અંગે અંદાજે ૧૦૦ વેપારીને નોટિસ પાઠવી હતી. આ અંગે સુધરાઇના શોપ ઇન્સ્પેક્ટર હિતેન્દ્રસિંહ જાડેજાએ જણાવ્યું કે, ટેક્સ સુપરિટેન્ડેન્ટ, સર્વેયર, ઇન્જિનીયર સાથેની ટીમે કાર્પેટ એરિયા સહિતની માપણી સાથે ઉપરોક્ત નોટિસ પાઠવી હતી. આ ઉપરાંત બે દિવસમાં નગરપાલિકાને ૧૧.૫૦ લાખની આવક થઇ છે. શ્રી જાડેજાએ વધુમાં ઉમેર્યું કે, આ કાર્યવાહી ૩૧ માર્ચ સુધી ચાલુ જ રહેશે.

ભુજમાં અંકરવાલા સરસ્વતી શિશુવાટિકા તથા રંગવાલા માધ્યમિક વિદ્યામંદિરના વાર્ષિકોત્સવ 'વસંતરાગ'ની ઉજવણીએ ઉપસ્થિત મંચસ્થ અગ્રણીઓ પ્રથમ જ્યારે બીજી તસવીરમાં સાંસ્કૃતિક કાર્યક્રમ રજૂ કરતા બાળકો દૃશ્યમાન થાય છે. (તસવીર : યોગેન ખત્રી)

દેશના વિકાસ માટે સંસ્કાર સિંચન જરૂરી

ભુજમાં અંકરવાલા સરસ્વતી શિશુવાટિકા તથા રંગવાલા માધ્યમિક વિદ્યામંદિરનો વાર્ષિકોત્સવ ઉજવાયો

ભુજ, તા. ૪ : કચ્છના ખૂણેખૂણા સુધી શિક્ષણ પહોંચાડવાની નેમ જાણીતા દાતા અને ઉદ્યોગપતિ દામજીભાઇ એન્કરવાલાએ વ્યક્ત કરી હતી.

આજે ભુજના ટાઉનહોલ ખાતે યોજાયેલા કચ્છ કલ્યાણ સંઘ સંચાલિત એન્કરવાલા સરસ્વતી શિશુવાટિકા અને વિદ્યામંદિર તથા રંગવાલા માધ્યમિક વિદ્યામંદિરના વાર્ષિકોત્સવની ઉજવણી 'વસંતરાગ' કાર્યક્રમના અધ્યક્ષ સ્થાનેથી દામજીભાઇએ વધુમાં ઉમેર્યું કે, બાળકોમાં સંસ્કારોનું સિંચન દેશના વિકાસમાં મહત્ત્વનું ભાગ ભજવે છે. બાળકોમાં આવા સંસ્કારોનું સિંચન કરતા વિદ્યાસંકુલના ટ્રસ્ટીઓ, આચાર્ય, શિક્ષકોની કામગીરીને બિરદાવી હતી.

કાર્યક્રમના મુખ્ય અતિથિપદેથી બોર્ડર રેન્જના આઇજીપી એ. કે. જાડેજા (આઇપીએસ)એ કાર્યક્રમમાં આમંત્રણ બદલ ખુશી વ્યક્ત કરી સંસ્થાને રાષ્ટ્રવાદને વરેલું સંગઠન લેખાવ્યું હતું. તેમણે વિદેશ વસતા અનેક ભારતીયોના વતનપ્રેમના ઉદાહરણો ટાંકી દેશ પ્રત્યેની તેમની ભાવના બિરદાવી હતી. અતિથિવિશેષ સમગ્ર વિકાસ વિદ્યાભારતી ગુજરાત પ્રદેશના સંયોજક એવા ભરતભાઇ ધોકાઇએ આત્મિક, શારીરિક, પ્રાણિક, માનસિક અને બૌદ્ધિક વિકાસને ટાંકી સમજ આપી હતી. હિન્દુ કાઉન્સિલ ઓફ આફ્રિકાના પ્રમુખ મૂળજીભાઇ પિંડોરિયાએ ધર્મના ભાગલા પર ટકોર કરતાં ધર્મની રક્ષા પર ભાર મૂક્યો હતો. શ્રી પિંડોરિયાએ ભારતીયોને અપીલ કરતાં જણાવ્યું કે, જે દેશમાં વસો ત્યાંના ગરીબ લોકોની મદદ-સેવા કરજો.

મંચસ્થ અગ્રણીઓના હસ્તે દીપ પ્રાગટ્ય બાદ પ્રાસંગિકમાં મેહુલભાઇ શાહે દરેક વિપદાઓ સમયે કચ્છ કલ્યાણ સંઘ કચ્છની સાથે જ રહ્યું હોવાનું જણાવી વિદ્યામંદિરની ૨૬ વર્ષની સફર બદલ ગૌરવની લાગણી વ્યક્ત કરી હતી.

આ અવસરે શિશુવાટિકાના પ્રધાનાચાર્યા વર્ષાબેન ઠક્કર, આચાર્ય દિવ્યપ્રભાબેન વાયડા, જયાબા જાડેજા, કલ્પનાબેન આશરનું વિશિષ્ટ સેવા બદલ તેમજ વિવિધક્ષેત્રે સિદ્ધિપ્રાપ્ત વિદ્યાર્થીઓ રવજી રબારી, કિશન પરમાર તથા હેન્સી રાઠોડનું સન્માન કરાયું હતું.

મંચસ્થ અગ્રણીઓનું નવીનભાઇ વ્યાસ, મેહુલભાઇ શાહ, નિરૂપમભાઇ છાયા, સુભાષભાઇ જોષીના હસ્તે સન્માન કરાયું હતું. વર્ષાબેન ઠક્કર, હેતલબેન બારમેડા મંચસ્થ રહ્યા હતા.

સમગ્ર વિકાસની થીમ સાથે 'વસંતરાગ' કાર્યક્રમ અંતર્ગત ટીપણી રાસ, ડાંગી નૃત્ય સહિતની કૃતિઓ વિદ્યાર્થીઓએ રજૂ કરી ઉપસ્થિતોની દાદ મેળવી હતી. વિવિધ વેશભૂષામાં સજ્જ બાળકોથી ટાઉનહોલ ગાજી ઊઠ્યો હતો. મોટી સંખ્યામાં વાલીઓએ કાર્યક્રમ માણ્યો હતો. સંચાલન રાજેશભાઇ દવે તથા નીરવબેન પાંધીએ કર્યું હતું. આભારવિધિ કેશુભાઇ ઠાકરાણીએ કરી હતી.

૩૧મી મે બાદ નિવૃત્ત થનારા પંચાયતી કર્મી.ના પેન્શન કેસ ગાંધીનગર સ્તરે

રાજ્ય સરકારના નાણાં વિભાગે ઠરાવ બહાર પાડ્યો

માંડવી, તા. ૪ : ગુજરાત સરકારના નાણા વિભાગના ઠરાવ મુજબ તા. ૩૧-૫-૨૦૧૫ પછી નિવૃત્ત થનાર પંચાયત સેવાના કર્મચારીઓના પેન્શન કેસો ગાંધીનગરથી મંજૂર થશે.

ગુજરાત રાજ્ય પ્રાથમિક શિક્ષક સંઘના મીડિયા કન્વીનર દિનેશભાઇ શાહે માહિતી આપતાં જણાવ્યું હતું કે, રાજ્ય સરકારે પેન્શન અંગેની કામગીરીમાં એકસૂત્રતા જાળવવા પંચાયત સેવાના કર્મચારીઓની પેન્શનની કામગીરી નિયામક, પેન્શન અને પ્રોવિડન્ટ ફંડની કચેરી ગાંધીનગરને સોંપવાનું ઠરાવ્યું હતું.

આ ઠરાવ તારીખ અગાઉ પંચાયત સેવાના જે કર્મચારીઓ તા. ૩૧-૫-૨૦૧૫ બાદ નિવૃત્ત થતા હોય અને તેઓના પેન્શન કેસો અગાઉ લોકલફંડ નિરીક્ષકની કચેરીમાં મોકલવામાં આવ્યા હોય તેવા તમામ કેસો લોકલફંડ નિરીક્ષકની કચેરી દ્વારા નિયામક, પેન્શન અને પ્રોવિડન્ટ ફંડની કચેરીને ગાંધીનગર મોકલી આપવાના રહેશે.

વેરાન વગડામાં વસંતનાં વધામણાં કરતા કેસૂડા ખીલ્યા. (તસવીર : રમેશ રાશિયા)

માંડવીની કોલેજમાં તસવીરમાં દેખાતું ભવન કન્યા છાત્રાલયના નામે બન્યું છે પરંતુ તેનો ઉપયોગ ગેસ્ટ હાઉસ તરીકે થઇ રહ્યો છે

માંડવીમાં કન્યા છાત્રાલય બન્યું ગેસ્ટ હાઉસ !

તમામ નિયમોને નેવે મૂકી થયેલા બાંધકામમાં ભ્રષ્ટાચારની ફરિયાદ ઊઠી

જીવરાજ ગઢવી દ્વારા

કોડાય, તા. ૪ : માંડવી કોલેજમાં યુનિવર્સિટી ગ્રાન્ટ કમિશન (યુજીસી)ના દાનમાંથી નવનિર્મિત માતા જયાલક્ષ્મીબેન સુરજી કન્યા છાત્રાલયનું નિર્માણ બાદ ઉદ્ઘાટન પણ થઇ ગયું તેને લગભગ ૧૨ માસ જેટલો સમય થવા છતાં એક પણ કન્યાને પ્રવેશ આપવામાં આવ્યો નથી અને તેનો ઉપયોગ કોલેજના વહીવટદારો દ્વારા ગેસ્ટ હાઉસ તરીકે કરવામાં આવી રહ્યો હોવાની વિગતો બહાર આવી છે.

આધારભૂત સૂત્રો પાસેથી મળતી વિગત મુજબ યુજીસીએ આ હેતુસર ૯૫૦૦ ફૂટ બાંધકામમાં ૮ રૂમો તથા ૧ કિચન, ૧ વાંચનાલય, ૧ ભોજનાલય, ૧ વોર્ડન રૂમ, ૧ સીટીંગ રૂમના નકશા પાસ થયેલા છે. પરંતુ બાંધકામ માત્ર ૨૫૦૦થી ૩૦૦૦ ફૂટ જ કરવામાં આવ્યું છે તેમાં માત્ર ૬ રૂમોનું જ બાંધકામ જ કરવામાં આવ્યું છે. કન્યા છાત્રાલય હોય તો કંપાઉન્ડ વોલ બનાવવાની જરૂરિયાત છે છતાં બંધાઇ નથી.

અગાઉ આ છાત્રાલય ખીમજી વેલજી અને દેવજી વેલજી ગોધરાવાળાના નામે કાર્યરત હતું અને આ જૂની હોસ્ટેલને સંપૂર્ણ ધ્વંસ કરીને નવી બનાવવામાં આવી હતી જેમાં (નગરસેવા સદનની પરવાનગી વગર) જૂના દાતાની તકતી પણ દાતાની સહમતી વિના કાઢી મુકવામાં આવી છે અને હવે નવું નામ 'માતુશ્રી જયાલક્ષ્મીબેન સુરજી કન્યા છાત્રાલય' રાખવામાં આવ્યું હોવાનું જાણવા મળ્યું છે.

ચોંકાવનારી બાબતો એ જાણવા મળી છે કે, યુજીસીએ આ હેતુસર ચાલીસ લાખ મંજૂર કરીને તેની સામે ૩૬૦૦૦૦૦ ફાળવી દીધા છે પરંતુ તેમાં શરત એ હતી કે, પ્લાન મુજબના બાંધકામમાં બાકીનો ખર્ચ દાતાઓ ઉભા કરીને કોલેજ/ટ્રસ્ટે કરવાનું હતું પરંતુ યુજીસીમાં મંજૂર કરાવેલા રૂમોથી ઓછું બાંધકામ એટલે કે, ૩૦૦૦૦૦૦ જેટલું કરાવીને કોલેજના ચોપડે ૫૧૦૦૦૦૦ જેટલો ખર્ચ બતાવવામાં આવ્યો છે. બાંધકામના કામમાં મોટા પાયે ભ્રષ્ટાચારની ગંધ આવતાં જાગૃત નાગરિક તરફથી કોલેજના વહીવટદાર, પ્રિન્સીપાલ, ક્લાર્ક, કોન્ટ્રાક્ટરને કાયદાકીય નોટિસ ફટકારતા શિક્ષણ આલમમાં હોબાળો મચી ગયો છે.

આ બાબતે કોલેજના વહીવટદાર જે.સી. પટેલનો ટેલિફોનિક સંપર્ક સાધતા તેઓએ કહ્યું કે, નોટિસ કોલેજને મળી છે તે વાત ખરી છે. નગર સેવા સદનની મંજૂરી લેવાઇ નથી. જૂની હોસ્ટેલના દાતાની મંજૂરી પણ લેવાઇ નથી. આ વાત સ્વીકારી હતી અને આ અંગે કોઇ નક્કર જવાબ આપી શક્યા નથી. ઇન. પ્રિન્સિપાલ શ્રી આરૂણા સંપર્ક સાધતા કહ્યું કે મેં ચાર્જ સંભાળ્યો તે પહેલાની દરખાસ્ત કરવામાં આવી હતી.

રાપર તાલુકાના કુપોષિત બાળકોની તપાસ માટે સરકારી તબીબો ઘેર જશે

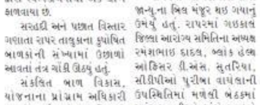
બહારી આરોગ્ય સેવાના ખર્ચ માટે જિલ્લા પંચાયત દ્વારા સ્વભંડોળમાંથી એક લાખ ફાળવાયા

ભુજ, તા. ૪ : રાપર તાલુકાના કુપોષિત બાળકોની આરોગ્ય તપાસ માટે આઠ પ્રાથમિક આરોગ્ય કેન્દ્રના તબીબ અને આરોગ્ય ટીમ તેમના ઘેર જશે. ઉપરાંત સરકારી સેવા ન મળતી હોય તેવી સિટી સ્કેન, સોનોગ્રાફી, એક્સરે વગેરેની જરૂરત ઉભી થાય તો તેના ખર્ચને પહોંચી વળવા જિલ્લા પંચાયત દ્વારા સ્વભંડોળમાંથી એક લાખ ફાળવાયા છે.

સરહદી અને પછાત વિસ્તાર ગણાતા રાપર તાલુકાના કુપોષિત બાળકોની સંખ્યામાં ઉછાળો આવતાં તંત્ર ચોંકી ઊઠ્યું હતું.

સંકલિત બાળ વિકાસ યોજનાના પ્રોગ્રામ અધિકારી ઇરાબેન ચૌહાણે વધુ વિગતો આપતાં જણાવ્યું હતું કે, કુપોષિત બાળકોની સંખ્યા વધતાં જિલ્લા કલેક્ટર અને જિલ્લા વિકાસ અધિકારી દ્વારા તપાસ કરવાની આપેલી સૂચનાનો અમલ કરતાં સ્વસ્થ બાળકોની સંખ્યા ઉમેરાઇ ગયાની ભૂલ બહાર આવી હતી. મધ્યમ કક્ષાના કુપોષિત બાળકો ૧૮૭૧ અને અતિ કુપોષિત બાળકોની સંખ્યા ૪૧ છે જે અન્ય તાલુકાના પ્રમાણમાં વધુ હોવાનું તેમણે ઉમેર્યું હતું.

રાપરની આંગણવાડીઓના જાન્યુ.ના બિલ મંજૂર થઇ ગયાનું ઉમેર્યું હતું. રાપરમાં ગઇકાલે જિલ્લા આરોગ્ય સમિતિના અધ્યક્ષ રમેશભાઇ દાફલ, બ્લોક હેલ્થ ઓફિસર ડી.એસ. સુતરિયા, સીડીપીઓ પૂરીબા વાઘેલાની ઉપસ્થિતિમાં મળેલી બેઠકમાં આંગણવાડીઓ અંગે માઇક્રો પ્લાનિંગ કરાયું હતું. કુપોષણ અને સ્વાઇન ફ્લુ સંબંધી આયોજન ગોઠવાયું હતું. આજે મળતા દિને કુપોષિત બાળકોની ચકાસણી કરાશે. રાપરના સંજીવની કેન્દ્રને એક લાખનું અનામત ભંડોળ જિ.પં. પ્રમુખ ત્રિકમભાઇ છાંગા દ્વારા ફાળવાયું છે.



રાપરના કુપોષિત બાળકો અને સ્વાઇન ફ્લુ અંગે યોજાયેલી બેઠકમાં જિલ્લા આરોગ્ય સમિતિના અધ્યક્ષ રમેશભાઇ દાફલ, આઇ.સી.ડી.એસ.ના પ્રો. અધિકારી ઇરાબેન ચૌહાણ, તા.આ. અધિકારી ડો. સુતરિયા વગેરે.

'કાઝરી' દ્વારા ખાસ સીરિયાથી મંગાવીને જેનું સંવર્ધન-ઉછેર કાર્ય હાથ ધરાયું છે તે કાંટા વિનાના થોરને નિહાળી રહેલા જિલ્લાના ખેડૂતો.

સીરિયાના થોરથી કચ્છની કાયાપલટ

કાંટા વિનાના થોરનું 'કાઝરી'માં નિદર્શન : ૮૯ ખેડૂતોએ રસ બતાવ્યો

ભુજ, તા.૪ : કચ્છની આબોહવા અને જમીનની વિવિધતા ઉપરાંત પાણીની ઓછી ઉપલબ્ધતાને ધ્યાને લેતાં કાંટા વગરના થોરની વાવણી જિલ્લાની કૃષિ વ્યવસ્થાની કાયાપલટ કરી શકવા સક્ષમ છે. આ પ્રકારના થોર ભારતમાં થતા નથી પરંતુ પહેલી વખત કેન્દ્રીય શુષ્ક વિસ્તાર અનુસંધાન કેન્દ્ર (કાઝરી) દ્વારા સીરિયા, જોર્ડન અને બ્રાઝિલ જેવા દેશમાંથી આ થોરને મંગાવીને કુકમા ખાતેના તેના કેન્દ્રમાં વિકસિત કર્યા છે. આ થોર અંગે ખેડૂતોમાં જાગૃતિ કેળવાય તે માટે કાઝરી દ્વારા પ્રત્યક્ષ નિદર્શનના કાર્યક્રમ યોજાયો હતો જેમાં ૬૧ મહિલા ખેડૂત સહિત ૮૯ ખેડૂતોએ ભાગ લીધો હતો અને કાંટા વિનાના થોરના ઉત્પાદનને આગળ વધારવામાં રસ બતાવ્યો હતો.

કાઝરી પરિસરમાં આઇસીએઆર-આઇસીએઆરડીએના સહકારમાં યોજાયેલા આ કાર્યક્રમમાં કાઝરીના વડા ડો. દેવીદયાલે કહ્યું કે જિલ્લામાં જ્યારે પડતર ભૂમિ વિશાળ પ્રમાણમાં ઉપલબ્ધ છે ત્યારે કાંટા વિનાના થોર પર્યાવરણ રક્ષક બનવાની સાથે કચ્છમાં પ્રવર્તતી ચારાની અછતને પણ નિવારી શકે તેમ છે. આ પ્રકારના થોર પશુઓ માટે પોષક ચારો છે. આયોજક સંસ્થાના ભૂમિ વૈજ્ઞાનિક ડો. સમસુદીન મંગલસરાયે કાંટા વિનાના થોર અંગે હાલમાં ચાલતા અભ્યાસની માહિતી આપી હતી.

જોધપુર કાઝરીના વડા (ડિવિઝન-ટુ) ડો. સુરેશ કુમારે લીલા અને સૂકા ચારા તરીકે થોરની ઉપયોગીતા જણાવી હતી.

સરહદ ડેરીના પશુ ચિકિત્સા અધિકારી ડો.કે.પી. આર. લાલાણીએ પણ કાંટા વિનાના થોર કચ્છમાં પશુપાલનના અર્થતંત્રને બદલવા સક્ષમ હોવાનું કહ્યું હતું.

કોટડાના મહિલા ખેડૂત અમૃતબેન પટેલ, શિકારપુરના છગનભાઇએ પ્રતિભાવ આપ્યા હતા. કવીક કાઝરીના સંજયકુમારે આભારવિધિ કરી હતી.

Appendix 10: Cactus Field Day Schedule and Attendance

CENTRAL ARID ZONE RESEARCH INSTITUTE
REGIONAL RESEARCH STATION
KUKMA – 370 105, BHUJ - KACHCHH, GUJARAT

Field day on Cactus

03-03-2015

(Sponsored by ICAR-ICARDA project)

Organised by KVK, Bhuj and CAZRI, Jodhpur

Time	Programme	
9.00- 10.00	**Registration and Tea**	Sh. Sitaram Jat, Sh Sachin Patel and Sh Vijay Patel
10.00-1.00		Programme
	Welcome	Dr. Devi Dayal, Head
	About cactus research at RRS	Dr. Shamsudheen M, Scientist
	Utilisation of cactus as fodder	Dr. Suresh Kumar, Head, Div II, CAZRI, Jodhpur
	Response from farm representative and discussion	-
	Concluding remarks	Chairman
	Vote of thanks	Sh. Sanjay Kumar, SMS, KVK
1.00-2.00	**Lunch**	
2.00-5.00	**Field visit of cactus at RRS**	Sh Sitaram Jat, Sh Sachin Patel and Sh Vijay Patel

Appendix 11: List of Participants Women Training

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur
Field Day on Cactus at Bhuj (Gujarat)
Krishi Vigyan Kendra, RRS, CAZRI, Bhuj
March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock Cow	Goat/ Sheep	Buffalo	Signature
1	Makwani Arunaben M.	Kotda Athamna 9974449563	1	-	5	[illegible]
2	Makwani Durgaben H.	Kotda Athamna	1	-	2	[illegible]
3	Makwani Gitaben B.	"	1	-	1	[illegible]
4	Makwani Harshaben K.	"	1	-	2	Harshaben K
5	Makwani Jyotsnaben B.	"	1	-	1	[illegible]
6	Makwani Parvatiben M.	"	1	-	2	[illegible]
7	Bhojani Lakshmi P.	"	-	-	2	[illegible]
8	Makwani Manjulaben N.	"	2	-	-	M.N. Makwani
9	Chhabhaiya Amrutaben	Kotda Ugamna 7567878172	1	-	-	[illegible]
10	" Parvatiben	Kotda Ugamna	2	-	1	[illegible]
11	" Narmadaben	"	2	-	-	[illegible]
12	Dhalu Shantaben	"	2	-	-	[illegible]
13	Parwadiya Varshaben M.	"	1	-	2	[illegible]

1

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur
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Krishi Vigyan Kendra, RRS, CAZRI, Bhuj
March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock Cow	Goat/ Sheep	Buffalo	Signature
14	Patel Hemlataben S.	Kotda Ugamna.	1	-	4	[illegible]
15	Patel Bhamuben J.	"	1	-	2	[illegible]
16	Samat Ranchhod	Juna Kataria 9687391761	2	-	2	[illegible]
17	Navgan Tadi	"	1	-	-	[illegible]
18	Hitesh Samat	"	-	-	-	[illegible]
19	Raju Bhikha	"	2	-	2	[illegible]
20	Parbat Ranchhod	"	3	-	-	[illegible]
21	Gokar Heera.	"	-	-	-	[illegible]
22	Dharamshi Ramji	"	-	-	-	[illegible]
23	Mamaya Ravu	"	1	-	-	[illegible]
24	Valji Ganesha.	"	2	-	-	[illegible]
25	Ramji Bhikha	"	1	-	-	RB
26	Pachabhai Upadhyay	"	-	-	-	[illegible]

2

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur
Field Day on Cactus at Bhuj (Gujarat)
Krishi Vigyan Kendra, RRS, CAZRI, Bhuj
March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock Cow	Goat/ Sheep	Buffalo	Signature
27	Jadeja Pratapsinh A.	Rehya Nana	3	-	6	P.A. Jadeja
28	" Chandubha Godji	9974280646	2	-	2	[illegible]
29	" Rabubha Sumarji	"	2	-	1	R.S. Jadeja
30	" Khetubha Shumarji	Rehya Nana	1	-	3	[illegible]
31	" Sultansi Jurasi	"	-	-	3	[illegible]
32	Jadeja Mahendrasinh Chenubha	"	2	-	-	[illegible]
33	" Premsangji Sajtaji	"	1	-	2	[illegible]
34	" Jitubha Gajamji	"	2	-	-	[illegible]
35	" Luhar Asrub Jakub	"	2	-	-	[illegible]
36	Jadeja Sambha Putrandi	"	2	-	2	[illegible]
37	Vaniya Ashish D.	Anjar	2	-	-	[illegible]
38	Vaniya Bhikaji	Anjar 9898857070	2	-	-	[illegible]
39	Chetan R. Vadher	Bhuj. (W.RT. Agri.)	-	-	-	[illegible]

3

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur
Field Day on Cactus at Bhuj (Gujarat)
Krishi Vigyan Kendra, RRS, CAZRI, Bhuj
March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock Cow	Goat/ Sheep	Buffalo	Signature
40	Sadhu Jagdishbhai B.	Shikarpur 9879273448	20	-	-	[illegible]
41	Barmaniya Mudilbhai D.	Shikarpur	2	-	2	[illegible]
42	Patel Pavanbhai M.	"	2	-	3	[illegible]
43	Desai Manjulaben H.	"	2	-	2	[illegible]
44	Thadhi Babubhai B.	"	1	-	1	[illegible]
45	Miyatra Samabhai D.	"	3	-	-	[illegible]
46	Jaaya Umarsaleh	"	-	-	-	[illegible]
47	Kali Vinodbhai	"	1	1	1	[illegible]
48	Kali Chhaganbhai	"	2	-	3	[illegible]
49	Kamariya Dinesh	" W.DT (Agri.)	-	-	-	[illegible]
50	Patel Kishorbhai T.	Kukma 9879618601	-	-	2	[illegible]
51	Patel Sandiphai D.	Madhapar 9879922274	-	-	2	[illegible]
52	Rana Yogendrasinh J.	MAT (Agri.) Bhuj, 7567899087	-	-	-	[illegible]

4

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur

Field Day on Cactus at Bhuj (Gujarat)

Krishi Vigyan Kendra, RRS, CAZRI, Bhuj

March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock			Signature
			Cow	Goat/ Sheep	Buffalo	
53	Parmar Naresh R.	Bhuj- ATMA, ATM. 9662787878-28	-	-	-	
54	Patel Narendrasinh H.	Manjal / Hamla. 99097 87123	5	-	-	
55	Maheshwari Desar Lesa	"	3	-	-	
56	Bhanushali. Jitesh Mulji	"	2	-	-	
57	Jadeja patubha Nelubha	"	2	-	4	
58	Ashok Ranjitsingh Jadeja	"	8	-	-	A.R. Jadeja
59	Bhupatsinh R. Jadeja	"	15	-	30	
60	Parmar Rajmal.	"	-	-	-	
61	Rameshbhai Lesva	Kot Fotdi	-	-	-	
62	Rameshbhai maram	Fotdi	-	-	-	
63	Valji Lemji	Fotdi	-	-	-	
64	Vishal bhai	Fotdi	-	-	-	
65	Raghubha Jadeja.	Rehna (mamu)	1	-	2 -	

5

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur

Field Day on Cactus at Bhuj (Gujarat)

Krishi Vigyan Kendra, RRS, CAZRI, Bhuj

March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock			Signature
			Cow	Goat/ Sheep	Buffalo	
66	Sachin R Patel	Shektori - Bhuj				
67	Vijay J. Patel.	CAZRI, Bhuj				
68	Nisha D Goswami	"				
69	Sushil Kumar	CAZRI, RRS, Lekhna				
70	Sanjay Kumar	"				
71	Arvind Tetarwal	"				
72	Dipesh Machhisat					
73	Ram Niwas	KVK, CAZRI, Kukma, Bhuj				
74	Dr. Shamshudeen	"				
75	Mohar Singh	"				
76	Sitaram Jat	"	10	20	2	
77	Bharat Vispuria	"				
78	Havgovind Kulpuria	"				

6

ICAR-ICARDA Project on *Opuntia ficus-indica* at CAZRI Jodhpur

Field Day on Cactus at Bhuj (Gujarat)

Krishi Vigyan Kendra, RRS, CAZRI, Bhuj

March 03, 2015

Sr. No.	Name of Farmer	Address	Live-stock			Signature
			Cow	Goat/ Sheep	Buffalo	
79	Suresh Kumar	Risi Kukma	-	-	-	
80	Jalpa Vasu	CAZRI, Bhuj				
81	Jagruti Matang	CDI.A. 28-29 Chalvadi Adipur				
82	Vandana Thakkar	CAZRI Bhuj				
83	Mahendra Kumar	"				
84	Ashok Kumar	"				
85	Jagadishbhai. D.	"				
86	Ravi Kiran	CAZRI, Jodhpur	—	—	—	
87	M. Suresh Kumar	CAZRI, Bhuj				
89	Rahul Dev	"				
90						

7

Appendix 12: Factsheet on the Agronomic Practices of Cactus in Hindi

पिपली थोर

कांटे दार थोर से हम सभी परिचित है AAAAलेकिन बिना कांटे वाला या कांटा रहिता थोर इसी कुल की एक अन्य थोर प्रजाती है जिसका वनस्पतिक नाम **ओपन्शिया फाइकस इन्डिका** है,AAA क्योंकि इस थोर के पत्ते पीपल के पते के आकर से मिलते जुलते है, इसलिए इसे "पीपली थोर" भी कहा जा सकता है.

* **क्या है "पीपली थोर" ?**

यह कांटा रहिता पीपली थोर पाचँ से आठ फूट की ऊचाई तक झाड की तरह उगता है, फिर उनके ऊपर अनेक पते भी उगते जाते है, जो एक दूसरे से जुडे रहते है. इसलिए ये गठांनो में ऊगे हुए दिखते है.

***"पीपली थोर" कहा उगाई जा सकती है?**

पीपली थोर शुष्क एवं अर्द्ध शुष्क क्षेत्रों में उगाया जा सकता है .इसके लिए गहरी रेतीली से दोमट मिट्टी ककरीली जगह उपयुक्त रहती है, जहा पर पानी खडा व इकटठा न हो इन सथनो के औसत वर्षा १५०-६०० मम, तापमान १८-२६ डिग्री सेलसियस होना चाहिए. बहुत ऊचें पर्वतीय क्षेत्रों में इसे उगना कठिन होगा .

***"पीपली थोर" कैसे उगाएँ ?**

इसे उगाने के विधि आती सरल है. इसकी मांसल पत्री या एक कलेडोड को तोड कर ,लगभग ५-६ दिन तक छाया में रखते है फिर प्रत्येक कलेडोड को पहले से तैयार नम तथा भुरभुरी मिट्टी में इस प्रकार लगते है मिट्टी में इस प्रकार लगाते हैं की एक तिहाई हिस्सा मिट्टी में दबा रहे व दो तिहाई ,मिट्टी से बाहर सीधा निकला रहे .इसके बाद इसमें एक गिलास पानी चारो ओर डाल दे लेकिन सिचाई १५-३० दिन बाद करे जबतक इसकी जड़े फूटान कर लेती है. गर्मीयों में १५-२० दिन में एक बार पानी देना पडता है . वर्षा काल में इसके चारों ओर पानी इकटठा होकर खडा न हो, ऐसी व्यवस्था करनी चाहिए,क्योंकि खडे हुए पानी में थोर गलने का खतरा रहता है. यही कारण है कि थोर कम वर्षा वाले रेतीले इलाकों में अधिक सफलतापूर्वक उगते है. सडी हुए गोबर की खाद या जैविक खाद वर्षा काल से पहले १/२ -१ किलो डाली जाता है. खरपत वार को पहले १-२ वर्षो में यदी हटा सके तो बेहतर वृद्धि होगी. पीपली थोर के रोपने के पश्चात १०-१२ दिनों में फूटना शुरू हो जाते है. नऐ पत्ते आने लागते है, एक निश्चित आकर व ऊचाई (८/१२ इंच)के बाद इन पर भी नए पत्ते आने लगते है . इस प्रकार १ वर्षो में १५-२० नए पत्ते एक मात्र पीपली पर उग जाते है. इन पर सूखे वातावरण में कोई बीमारी नहीं लगती लेकिन ज्यादा पानी में गलन रोग से मर सकते है, पहले से ही streptocyclone व कॉपर सलफेट के छिडका से इसे बचाया जा सकत है.

*"पीपली थोर"के क्या उपयोग है ?

१.इसके काचें पत्तों को काट कर सब्जी के रूप में इसका उपयोग कर सकते है.

२.इसके रसदार हल्के हरे रंग के फल लगते है ,जो कि छिलका उतारने के पश्चात ताजा ही खाया जा सकता है,इसका स्वाद हल्का मीठा व महक गाजर की तरह होती है. पौषिटक तत्वों से युक्त इसके फल यूरोप,अमेरिका व अफ्रीका में बहुत चाव से खाए जाते है.

३.इसके पत्तों को काट कर, चारा में मिला कर गाय, भेड आदि को खिलाया जा सकता है. काजरी में किये गए नए अनुंसधानो में इसके एक तहाई भाग चारे में मिला कर देने में उपरोकृ पशुओं में कोई भी नुकसान नहीं पाया गया तथा उनकी वृद्धि दर (भार में तथा ऊचाई,मोटाई में) में कोई विपरीत असार नहीं देखा गया.बल्की पशुधन को इससे अतिरिकत विटामिन सी व पानी के पर्ति हो गई.

- इसके अन्य कई औषधीय उपयोग भी पाए गए है.
- इस खेतो के मेंड पर, तथा परती भूमियो पर पर्वरण सुधर के लिए लगाया जा सकता है.

इसकी इतनी उपयोगिताऔ को देखते हुए इसे अधिकाधिक मात्रा में लगाएँ. इस हेतु तकनीकी मार्गदर्शन 'काजरी' से प्राप्त किया जा सकता है

For further details please contact Dr. Suresh Kumar, CAZRI, Jodhpur.

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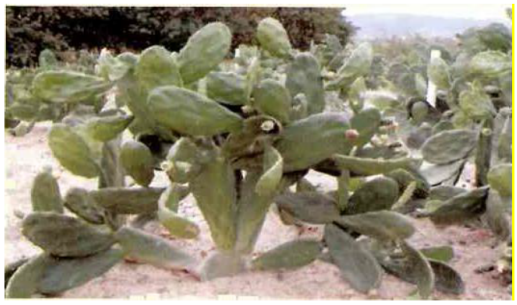
Appendix 13: Factsheet on Cactus as a Feed Resource Flyer

Prospects of cactus pear (*Opuntia ficus-indica* L.) in India

The cactus pear

Cacti are a group of plants belonging to the family Cactaceae, having 122 genera with approximately 1,600 species; nearly all of which characteristically have spines and exhibit stem succulencete. The widely cultivated cactus pear (*Opuntia ficus-indica L.*) belong to the sub family opuntioideae. Cactus pear show great adaptability to various soil conditions, as they can grow in poor, infertile desert soil and have tolerance to a wide range of soil pH.



Introduction in India

Cactus pear was first introduced in India in 1970. Since then many accessions have been introduced on different occasions in various institutions in India with varying success.

Botanical description

Opuntia ficus-indica is a shrub or tree up to 5 m tall, forming sturdy trunk with age. Joints flattened, narrowly elliptic to ovate, varying in size, 30-60 cm long and 6-12 cm broad, attenuate below, often acute above, fairly thick, glaucous-green; areoles small to large, raised and woolly, with 3-6 radiating, unequally long, greyish white spines up to 3 (-10) cm long, straight or occasionally slightly curved, or spineless (in older plants and some cultivars). Leaves, if developed, are minute, subulate and early deciduous. Flowers about 7 cm long; hypanthium broadly cylindrical, contracted blow, with numerous raises areoles spirally arranged, densely wooly and filled with glochidia, occasionally also bearing small spines and minute leaves; petaloid segments yellow or orange. Fruits ellipsoid, about 7cm long, reddish, succulent, edible. There is a distinction between the spiny naturalized pears, which are invasive weeds and the cultivated, spineless ones. The latter exits in several cultivars eg. *O ficus-indica forma inermis O. ficus-indica forma amyclaea and O. ficus-indica forma elongata.*

Ecology and distribution

The species is native to Mexico. It is the most common and widespread species in South Africa. It was introduced to Spain at the end of the 15th century. *O.ficus-indica* in particular is native to sub-tropical uplands. The development of *O. ficus-indica* is restricted in the Mediterranean basin by the winter cold temperatures. The spiny, naturalized pear is recorded as a pest in part of South Africa and Australia.

Altitude: 0-2, 600 m. Mean annual temperature: -18-26 deg C. Mean annual rainfall: 150-600mm. Soil type: Drainage is an important ecological factor: *O.ficus-indica* like most cacti, is very sensitive to lack of oxygen in the root zone and therefore cannot withstand any prolonged water logging. It thus tends to avoid clay soils which may be temporarily saturated, poorly drained or waterlogged. It generally prefers deep sandy soils.

Propagation and management

It is propagated through vegetative propagation from sufficiently old cladode or segments. The cladodes preferably be exposed to diffused sunlight for a week to improve rooting. The

planting is done in partially moist soil by keeping 1/3rd cladodes under the soil.

The first light irrigation should be given after about a months of planting. Light irrigation at about a 15 day interval should be given during summer months. Irrigation may be withheld during rainy season and utmost care should be taken to avoid water logging. Occasional light irrigation in winter during February-March support vegetative and reproductive growth.

Maintenance and weeding are done by 2-4 shallow disk ploughings per year in the fall and spring, with or without the inclusion of manure. Plantations are exploitable after 4-5 years and fully grown after 7-10 years; when well managed, some are known to have remained productive for more than 50 years.

Pests and diseases

Rotting of cladodes at the base during establishment and vertebrate pest such as peacokcs, prrots, rodents and squirrels eating cladodes are major problems. Prickly pear moth (*Cactoblasits caatorum*), prickly pear cochineal insect (*Dactylopius opuntiae*) and the prickly pear weevil (*Metamasius opuntiae*) are other pests through used in some countries for biological control of cactus invasions. Other occasional pests are fruit fly limiting fruit production, and bacterial rot and snails.

Uses of cactus Pear

As Vegetable

Opuntia such as *Opuntia ficus-indica, O.streptacantha* Lem., *O robusta, O.inermis De Candolle,* and *Nopalea cochenillifera* (L.) and *O.amyclaea* are used as vegetables or Nopalito in Mexico. This unique vegetable which is roasted, blanched or cooked after the spines and young leaves are removed has great potential, including salads and cooked dishes with meat. However, in India this has yet to become popular.

As Fruit Crops

Attractive and unique fruits *O.ficus-indica* has tasty flesh, eaten after rmoving the thick peel. It is much like in Europe, Americas and African countries.

As Animal Feed

The *Opuntia ficus-indica* is the most widely used species as animal feed the world over. *O.lindheimeri* Engelm. is used in Southern Texas, and *O.rastera* Weber, *O. robusta* wendland in Pfeiff., *O.engelmannii* Salm-Dyck, *O. megacantha* Salm Dyck, and *O. phaeacantha* Engelm are used in Mexico. The cladodes

consist mainly of water (85-95%) on fresh weight bases depending on growth conditions. The water content may drop to 60% under water stress conditions.

Animal feeding trails at Central Arid Zone Research Institute have shown good acceptability and palatability of chaffed thorn less cactus pear pads both by small ruminants and cattle. *Opuntia* can be a good source of nutrition for the grazing small ruminants in the arid region. *Opuntia* leaves (33 %) can be safely introduced in total mixed ration of goats and it can also reduce the water requirement of the animals in arid regions.

Services

Erosion control: Cactus hedges play a major role in erosion control and land-slope partitioning particularly when established along contours. The hedge is a physical obstacle to runoff, favoring temporary local runoff accumulation and silting, thus preventing regressive erosion. In arid lands subject to wind erosion, cactus hedges are an easy, cheap and efficient way of prevention and control of top soil loss and accumulation of wind-borne deposits.

Reclamation: Planting shrubs and particularly cacti is one of the easiest to rehabilitate deraded landscapes. Cacti, because of their easy establishment by vegetative propogation, are amenable to the rehabilitation of lands that could not be reclaimed through conventional agricultural methods because of their steep slope and other physical factor limitations. In Tunisia and Algeria for instance, stony and rocky slopes have been rehabilitated by planting cacti along contours.

Soil improver: Cacti help mainting soil fertility via their geobiogene and trace element cycling activities, enriching the top soil in organic matter and improving its structure and the stability of its aggregates, hence permeability and water uptake balance.

Boundary or barrier or support: The thorny varieties of *O.ficus-indica* such as forma amyclaea and forma elongate are often used as defensive hedges for the protection of gardens, orchards and olive groves throughout North America and in parts of Italy and Spain. These hedges demarcate boundaries as well.

Other services: The cactus hedges when established in double rows, play an important part in landscape organization, and in the local socio-economy, as evidence of land rights and land ownership in countries or regions where no land registry exists.

Future Potential

- In view of its multiple uses, large scale plantations either as blocks or as a component of farming systems has vast potential, especially in view of crop diversification and livelihoods.

- Several parts of India viz., Thar desers, Rann of Cachch, South West Haryana, Budelkhand and other similar rainfed areas would be the potential sites.

- Due to high water conservation ability and drought tolerance, it has potential of being used as an emergency feed during extreme drought as it can also greatly reduce the water needs of livestock.

- Exploitation of different species for high value medicinal, pharmaceutical and cosmetic industries need to be initiated.
- Rehabilitation of degraded sites-wastelands, rang/grasslands can be done through various governments schemes and green India mission.
- Development a network of cactus in India for its promotion and utilization.

- Establishing a collaborative programme with International Centre for Agricultural Research in the Dry Areas (ICARDA) for germaplasm exchange and knowledge sharing.

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Appendix 14: Blog on Utilizing Cactus as a Feed Resource in India

Reducing the Feed gap in Semi-Arid Areas of Western India with Cactus

Availability of feed resources during forage gap periods in semi-arid areas of India can be make or break for small pastoralists. During dry periods pastoralists not only struggle in providing feed resources to their livestock but also water. *Opuntia ficus-indica* (thornless cactus) is being promoted to address this problem and help farmers get through this critical period. The crop is easy to cultivate, drought tolerant, and palatable to livestock. The plant generates a high biomass of green forage – ranging from 10 to 15 tons (fresh cladodes) per hectare in semi-arid areas – which is packed full of essential nutrients, reducing the intense pressure that livestock might otherwise exert on scarce water resources and other rangeland plant species. The plant can also generate alternative sources of income as the fruit can be sold for consumption and the oil from the seed can be sold to cosmetic companies. Support from the Indian Government has made it possible to promote this new crop through ICARDA (the International Center for Agriculture Research in Dry Areas) in collaboration with CAZRI (Central Arid Zone Research Institute) and IGFRI (Indian Grassland and Fodder Research Institute). As cactus is not a traditional forage crop, the idea of using cactus as forage was first shared with the Indian Council of Agricultural Research (ICAR) in 2011 when Cactusnet organized a workshop in India. The momentum and commitment established at this meeting was essential to get this project of the ground.

While the final goal is to reduce forage gaps a lot of ground work has to be done to make this possible. Multiple cactus accessions have been shared from Brazil, Italy, and Tunisia and are being evaluated by multiple partners; CAZRI in Jodhpur Rajasthan, CSSRI (Central Soil Salinity Research Institute) in Karnal Haryana, Bhagalot University in Bagalkote Karnataka, and IGFRI in Jhansi Uttar Pradesh. Awareness days have been conducted with farmers to promote adaption and improved cultivation practices. Overall enthusiasm is high, however pads have been reserved for multiplication before they can disseminated to farmers. Fliers and factsheets have been created to disseminate preliminary results to garner support and awareness amongst the agricultural sector. All of these efforts assure that one day in the not so distant future, farmers in the district of Gujarat will be able to cultivate locally adapted cactus to address forage gaps and water needs in the driest parts of the year. If you ask the farmers in Bhuj, they are ready.


કચ્છમિત્ર

KUTCHMITRA ■ BHUJ ■ 05-03-2015 ■ THURSDAY

સીરિયાના થોરથી કચ્છની કાયાપલટ

Such efforts would not be possible without the funding support from the ICAR-ICARDA bilateral program and the voluntary assistance of members from Cactusnet in facilitating multiple cactus shipments.