

FODDER REVOLUTION IN EAST GODAVARI DISTRICT

An Initiative by CTRI - KVK



Dr. B. John Babu
Dr. P.V.V.S. Siva Rao
Dr. C. Chandrasekhara Rao
E. Vijaya Prasad
Dr. T.G.K. Murthy



Krishi Vigyan Kendra
CENTRAL TOBACCO RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
KALAVACHARLA - 533 294, E.G. District, A.P.



FODDER REVOLUTION IN EAST GODAVARI DISTRICT

An Initiative by CTRI - KVK

Dr. B. JOHN BABU
Subject Matter Specialist

Dr. P.V.V. S. SIVA RAO
Subject Matter Specialist

Dr. C. CHANDRASEKHARA RAO
Programme Co-ordinator

E. VIJAYA PRASAD
Subject Matter Specialist

Dr. T.G.K. MURTHY
Director, CTRI



KRISHI VIGYAN KENDRA
CENTRAL TOBACCO RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
KALAVACHARLA - 533 294, E.G. District, A.P.



FODDER REVOLUTION IN EAST GODAVARI DISTRICT

An Initiative by CTRI - KVK

March, 2012

Published by

Dr. T.G.K. Murthy

Director

Central Tobacco Research Institute

Rajahmundry - 533 105

Phone : 0883 - 2449871-4

Fax : 0883 - 2448341

e-mail : ctri@sify.com

All rights reserved. No part of this book may reproduced or transmitted in any form by print, microfilm of any other means without written permission of Director, CTRI

Authors

Dr. B. John Babu

Dr. P.V.V.S. Siva Rao

Dr. C. Chandrasekhara Rao

E. Vijaya Prasad

Dr. T.G.K. Murthy

Printed at

New Image Graphics, Vijayawada - 2, Ph : 0866 2435553

FOREWORD

East Godavari is an agriculturally potential district in Andhra Pradesh and is well known as the 'Rice Granary of South India'. Dairying which is a component of agriculture is becoming unprofitable due to non-availability of sufficient green fodder and also lack of high yielding and suitable fodder varieties.



In this regard efforts made by the Krishi Vigyan Kendra of the Central Tobacco Research Institute in fodder development through demonstrations is worth mentioning. Also fodder slips of popular varieties viz., Co-3 and Co-4 are supplied to farmers, directly by the KVK and also through identified satellite farmers. KVK has developed good linkages with line departments and other KVKs for fodder development in Andhra Pradesh.

I am confident that the publication on "Fodder Revolution in East Godavari District – An Initiative by CTRI-KVK" gives holistic view of fodder development activities and their impact on milk production and fodder availability.

I wish to compliment the authors for their sincere efforts in preparation of this bulletin which will help the entrepreneurs, extension functionaries, KVKs and line departments in promotion of fodder development.

A handwritten signature in green ink, consisting of stylized loops and a long horizontal stroke.

Rajahmundry
28-3-2012

(T.G.K. Murthy)
Director, CTRI

Contents

	Page No.
INTRODUCTION	5
OBJECTIVES	7
METHODOLOGY	8
1. Fodder demonstration block with different varieties	8
2. Training programmes and seminars	8
3. On Farm Trial (OFT) with Fodder variety Co-3	10
4. Front Line Demonstrations with Co-3 and Co-4	11
5. Promotion of Satellite Farmers	12
6. Communication through mass media	18
7. Supply of seed material from KVK	18
8. Impact studies	19
9. Cultivation practices of Co-4	20
10. Satellite farmers details	21
SILAGE MAKING	24
TOXIC PRINCIPLES OF FORAGES	27

INTRODUCTION

The Krishi Vigyan Kendra of Central Tobacco Research Institute (CTRI), Rajahmundry, East Godavari District was established in the year 1983 under the aegis of Indian Council of Agricultural Research. This Centre over the years is engaged in implementing the mandatory activities like Technology Assessment and Refinement, Front Line Demonstrations, Trainings, Extension activities, Seed and seedling production and organizing sponsored programmes. Through these activities, the KVK has done transfer of feasible and economically viable technologies to the farmers, farm women and rural youth to improve their socio-economic condition.



East Godavari is one of the agriculturally potential districts of Andhra Pradesh. The district is divided into 3 zones, viz., delta, upland and agency areas. The district comprises of 5 revenue divisions, 60 revenue mandals



and 1379 villages. The total population of the district is about 51.51 lakhs. The rural population of the district is 37.36 lakhs. The sex ratio in the district is 1005 females per 1000 males and the literacy rate is 71.3%.

India is the largest milk producer in the world. Though India ranks first in milk production, the per capita milk availability is only 210 g/ day as against ICMR recommendation of 283 g. India has more than 300 millions of cattle population and more than 53% of the world's buffalo population. In East Godavari district Cows (2,90,158) and buffaloes (6,85,085) are the important milch animals which include both non-descript, graded and also crossbred breeds. Agri-Horti-Animal Husbandry farming system is predominant in the district. Visakha dairy, Smithkline Bechem, Heritage foods, Tirumala dairy, Vijaya dairy, private mini dairies and Motor cycle milk vendors are the chief sources of milk procurement from the dairy farmers. Dairying is being followed as subsidiary occupation as well as full time entrepreneurship. National committee on agriculture recommended 10% of the cultivable land should be brought under fodder cultivation. In Andhra Pradesh, only 2% of the land is under fodder cultivation. Based on the PRA techniques, group discussions, field surveys and also discussion with line departments, the problems in dairying were identified in East Godavari district.

Table 1: Thrust areas of dairy in East Godavari district

S.No	THRUST AREA	PRIORITY
1	Non availability of green fodder	*****
2	Non availability of high yielding, suitable fodder varieties	*****
3	Lack of additional cultivable land for fodder	****
4	Infertility in cattle	***
5	Mastitis in milch animals	**
6	Diseases like FM, HS and BQ	*

The present fodder production is inadequate to feed the available cattle population. Even the availability of roughages like paddy straw is declining due to cultivation of dwarf rice varieties and also harvesting of paddy by combined harvesters where the paddy straw is not fit for feeding cattle. This resulted in shortage of paddy straw availability for cattle. Thus, there is a need to increase the area under fodder cultivation and also productivity of fodder.

As the district is endowed with good natural resources like fertile soils, good surface irrigation as well as ground water sources, there is scope for introduction and popularization of high yielding fodder varieties. In addition, the district has 49,737 ha of coconut gardens and 15,246 ha oil palm gardens where the inter space can be effectively utilized for fodder cultivation without bringing extra land for fodder cultivation. Farmers are also innovative and entrepreneuring which is an added advantage for promotion of dairying. Considering the above situation, KVK, Kalavacharla has taken up the improvement of fodder availability in the district through introduction of high yielding varieties and bringing more area under fodder cultivation by demonstration, popularization and supply of fodder slips

OBJECTIVES

- To increase the fodder availability through introduction of high yielding fodder varieties
- To bring awareness on role of green fodder cultivation in milk yield improvement
- To make dairying viable and profitable through enhancing the fodder availability
- To improve the health of dairy animals through feeding green fodder there by reducing the disease incidence and inter-calving period by increasing the fertility status
- To increase the availability of fodder seed material through satellite farmers approach

METHODOLOGY

1. Fodder demonstration block with different varieties

Fodder production activity is initiated by KVK as early as 1991. Fodder demonstration plot was developed in 4.5 acres at Krishi Vigyan Kendra instructional farm, Kalavacharla. Different fodder crops were maintained for demonstration as well as for seed purpose.

Table 2: Fodder varieties maintained at KVK, Kalavacharla

S.No	Grasses	Legumes	Trees
1	Napier Bajra (NB-21, BN-2, APBN-1, Co-1,Co-2, Co-3, Co-4) Para grass, Guinea grass, Brazilian napier, M.P. Chari, PC-23, SSG 59-3, African tall maize, Johnson grass, Anjan grass, Rhodes grass, Eurochloa, Signal grass, Clitoria, Dinanath, Crysopogon	Soybean, Cluster bean, Sunnhemp, Cowpea, Stylo, Siratro, Centro, Desmanthas, Pilli Pesara, Lucerne	Acacia, Sesbania, Subabul, Gliricidia,

2. Training Programmes and Seminars

Regular training programmes were organized for farmers and farm-women on fodder production. A total no. of 1200 veterinary officers were trained on fodder production.

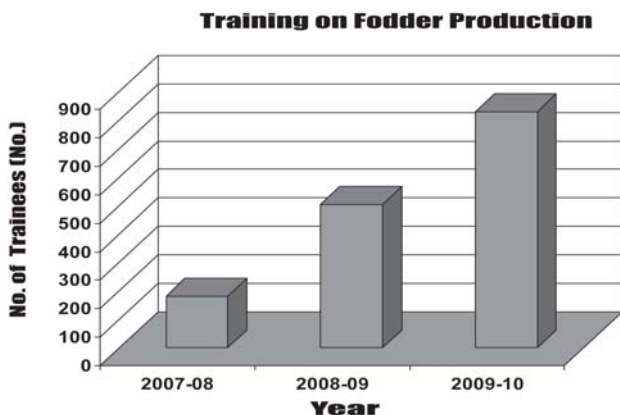
Indo - Swiss Project: Indo-Swiss project was sanctioned to Andhra Pradesh Government to promote live-stock development. Under this project, training programmes were conducted to veterinary Assistant Surgeons and Assistant Directors of State Animal husbandry department. Two hundred and fifty grass root level workers from different mandals viz., Veterinary Assistants and livestock Supervisors were brought to KVK and were trained in fodder production which is the take-off for fodder development in the district.

Training to 'Gopalamitras' on fodder production: Gopalamitras are the lay inseminators to conduct artificial insemination at farmers' doorsteps under the Department of Animal Husbandry. KVK trained these Gopalmitras in fodder production. Training programmes were conducted to farmers in association with farmers VV clubs promoted by NABARD, voluntary organizations, Institute of Animal Reproduction - Mandapeta, Forest Department – Rampachodavaram, Livestock Training Centre – Kakinada, Abyudya Karshak Parishad - Mukkamala, Kamadhenu Milk Producers Union- Nedunuru, Pallesiri- Tallarevu, World Vision - Vijayanagaram, SAAS- Samalkot and IRDA - Machilipatnam

In addition, KVK has conducted group discussions and seminars to Veterinary officers, officials involved in milk procurement such as Horlicks, APDDC and Vijaya Dairy. Five fodder seminars were conducted by KVK on fodder production. Each seminar was attended by 180-200 delegates. After completion of the seminar each delegate was given with a 5 kg fodder slips for promotion.

Table 3: Seminars on fodder production

SNo	Title of Seminar	Date
1	Fodder production technologies for higher milk production	10-7-1992
2	Fodder production for white revolution	9-7-1993
3	Improved fodder production technologies	12-7-1994
4	Seminar on fodder production	11-7-1997
5	State level seminar on fodder production	5 th and 6 th -9-2002



3. On Farm Trial (OFT) with Fodder variety Co-3

Low yields of green fodder is attributed to cultivation of age-old fodder varieties like Para grass. Co-3 is a perennial Napier Bajra fodder cultivar released by TNAU, Coimbatore. The technology was assessed for two consecutive seasons in different areas of East Godavari district. Cultivation of Co-3, yielded more than 120 quintals / acre / year. It gives 8-10 cuts in a year. It requires minimum number of irrigations at an interval of 10-15 days unlike weekly irrigations in the case of para grass. Animals fed with Co-3 fodder, the increase in milk yield per day per animal is 500 ml to 1000 ml.

Results of on-farm trials

Technological options	Performance of different parameters				
	Survival (%)	Interval of Irrigation (days)	No.of cuts/year	Yield (t/ha)	BCR
FP: Para grass	90	7-10	10	250	1:2.1
RP: Co-3 with recommended package of practices	70	10-15	10	300	1:2.8
Re.P: Co-3 with refined management practices	90	10-15	10	325	1:3.2

FP: Farmer's Practice, **RP:** Recommended Practice, **Re.P:** Refined Practice

Production Technologies for higher fodder yields

- Planting of stem cuttings in a furrow in slanting position. Due to this, the second node also reaches the ground and sprouting occurs at two nodes.
- Fertilizer in plant rows on 25th day after planting.
- Under taken intercultural operations with the country plough to overcome the weed problem.

4. Front line demonstrations with Co-3 and Co-4

After conducting the On-Farm Trials, Co-3 fodder variety was popularized by distributing the fodder slips to different farmers in different mandals of East Godavari district. During 2007-08, Co-4 fodder variety which has higher yield potential than Co-3 was introduced. Demonstration plots were maintained at farm level and tested the performance under field conditions in 2009-10 and 2010-11. The New variety Co-4 has shown better performance over Co-3 and there was 20t / ha higher yield over Co-3. During 2010-11, Perennial sorghum variety COFS brought from Coimbatore and tested its performance under field conditions in 10 villages. COFS variety shown 100% increase in yield over multi cut variety of sorghum. In addition to sole fodder crop, Co-3 and Co-4 are successfully introduced in coconut orchards as an intercrop which helped the coconut farmers to rear milch animals especially in 'Konaseema' area of East Godavari district. Surprisingly, the coconut production is also increased where the Co-3 / Co-4 is cultivated as intercrop due to regular irrigation and manure application for the fodder crop. Now Farmers are realizing an additional net income of ₹ 50,000 / acre / year in addition to coconut yield.

5. Promotion of satellite farmers

KVK identified progressive farmers in different mandals of East and West Godavari district, supplied fodder slips and also technical know-how of fodder cultivation. These farmers cultivated the Co-3 and also Co-4 fodders are now acting as satellite farmers to supply the fodder slips regularly. The fodder slips are supplied @ ₹ 5/- kg and they are earning ₹ 50000/- per acre/ year. Now they are recognized as fodder entrepreneurs. A list of satellite farmers are given below.

S.No.	Farmers Name & address	Mobile No.
1.	Babji, Pittalavani Cheruvu, East Godavari district	9440154256
2.	D. Raghu, Kalavacharla, East Godavari district	9849483246
3.	Satti babu Sitaramapuram, East Godavari district	9701881963
4.	Mutyala Rayudu, Gokavaram, East Godavari district	9948707475
5.	A Ramakrishna, Srirangapattanam, Korukonda, East Godavari district	9441113009
6.	Ramakrishna Varma, Dharmavaram, East Godavari district	9848090995
7.	Deepak Kumar, Namavaram, East Godavari district	8897111888
8.	S. Saradhi, Ambajipet, East Godavari district	9849111813
9.	M. Ramu, Morampudi, East Godavari district	9676534553
10.	P. Syamala Rao, Nedunuru, East Godavari district	9494159214
11.	G. Ramakrishna Raju, Kalavacharla, East Godavari district	0883-2484688
12.	Srinivas Rangam pet, East Godavari district	9848090995
13.	Ramesh, Chinnayagudem, West Godavari district	9491889999
14.	AMSU DAIRY, Karim Nagar	9959938383

In Krishna District, during 2003 Vijaya Dairy has taken 20 tonnes of Co3 fodder variety slips and supplied to the milk producers @ 20 kg each along with required fertilizers. Thus, 1000 farmers were supplied with these slips. These farmers in turn supplied fodder slips to other 10 neighbouring farmers of that village and acted as satellite farmers. Thus, 10,000 farmers were promoted in fodder cultivation and some of the

Fodder varieties at CTRI-KVK



Cowpea



Centro



Cryspogon



Gaint Bajra



Rhodes



Lucerne



Siratro



Stylo



Para grass



Co-4 variety



Seminars on fodder production



Training to Gopalamitras



Training to farmers



Transport on truck



Transportation on scooter



Transportation on bullock cart



Chaff-cutter



Azolla as cattle feed



CoFS-29 fodder variety

Satellite Farmers



► **R. Sattibabu**
Kalavcharla



M. Ramu 
Morampudi



Mutyala Rayudu
Gokavaram



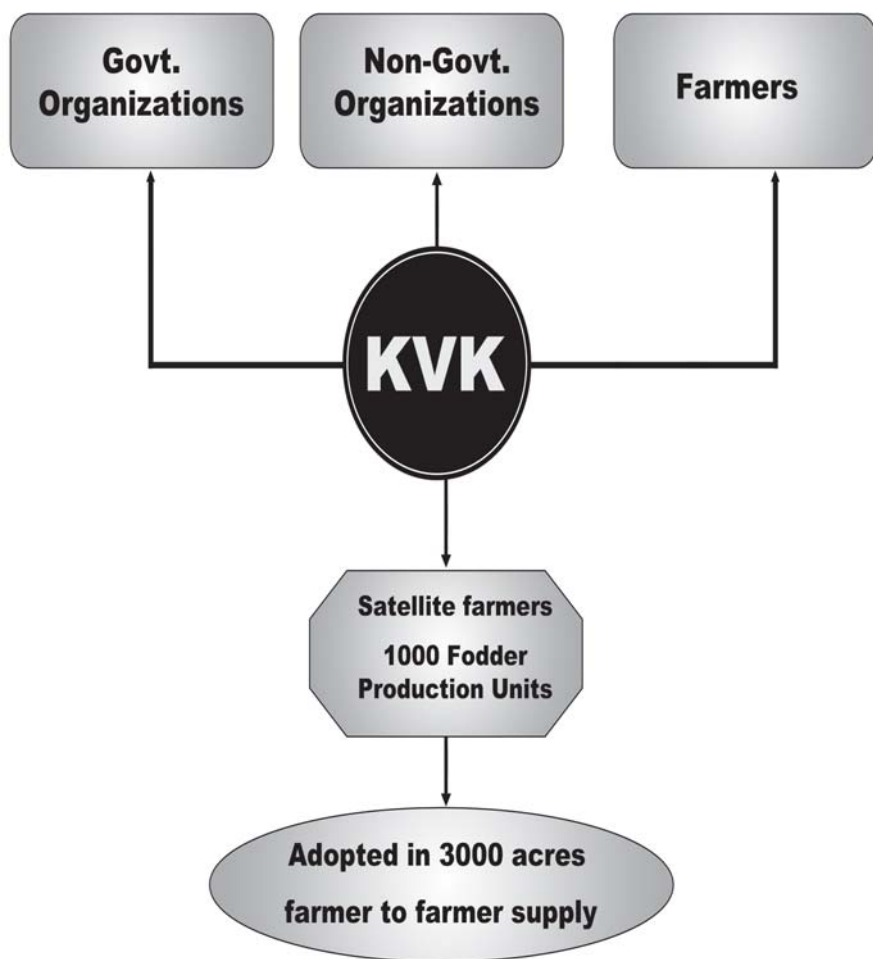
Ramakrishna varma
Dharmavaram



▶ **Surukuchi Saradhi**
Mukkamala

farmers are identified as resource persons for supplying fodder slips. This programme is implemented in Krishna District. The State Animal Husbandry department has taken up fodder crop cultivation under NREGS programme which has been successfully running mainly due to the seed material supply by KVK and also from satellite farmers developed by KVK.

Linkages with Line Departments and Voluntary Organizations



6. Communication through mass media

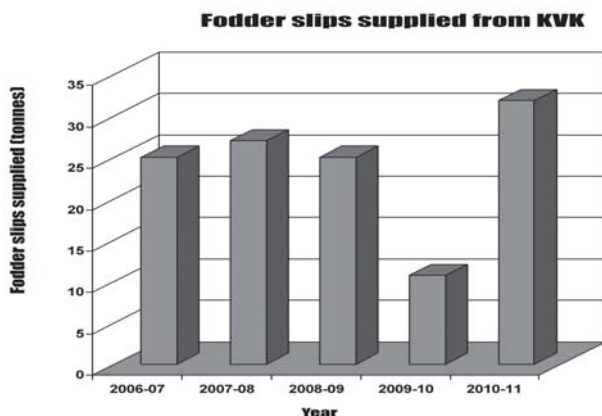
With the help of mass communication methods viz., TV, Radio, News paper coverage wide publicity was given to fodder production. Pamphlets were published in local language and distributed to farmers to create awareness on fodder production. A book entitled “ Improved fodder production technologies for higher milk production”, was published in 2002 by the KVK which is first of its kind in Andhra Pradesh. An article entitled “Pasugrasaalalo Raraaju was published in Annadata in December, 2004 which evoked good response

Fodder week celebrations are organized every year in the second week of July to promote the fodder production. Every year during technology week one day is allotted to impart training in Fodder production. The press and media has played a vital role in covering fodder cultivation activities taken up by KVK in and around the East Godavari district.

7. Supply of seed material from KVK

KVK is maintaining the bulk plots of Co-3 and Co-4 fodder varieties for supply of fodder slips to farmers, line departments, voluntary organizations and other KVKs.

Fodder cuttings are being supplied to the farmers. More than 250 tonnes of fodder slips were sold to farmers different organizations.



Supply to different KVKs in AP

KVK - Undi - West Godavari

KVK - Kavuru - Guntur

KVK - BCT - Yellamanchilli

KVK - Jammigunta

KVK - Venkataramana gudem

KVK - Pandirimamidi

8. Impact Studies

Impact studies on Fodder production was conducted by structured interview in twenty villages spread over the entire district. It was reported that there was hike in milk yield by $\frac{1}{2}$ to one litre per animal per day. Fodder availability was increased by 50-75% in the same cultivable land. Farmers opined that the cultivation of Co-3 and Co-4 varieties is easy and no risk is involved in cultivation. As the propagation is by vegetative means the purity of seed is maintained. Interspaces in coconut gardens and also the oil palm gardens are effectively utilized. It is the highly remunerative intercrop in coconut as well as in oil palm gardens. By cultivation of these fodder varieties the coconut yield is improved due to regular irrigations and fertilizer applications to fodder crops. Paddy straw requirement is reduced by 5 kg per day due to availability of green fodder in ad-lib. Winter dormance is not observed in these varieties. Palatability is at par with para grass. There was no change in fat % and SNF by feeding with these grasses compared to Para grass. Para grass is a water-loving grass and it requires more water because of which continuous irrigations are needed. Where as in Co-3 and Co-4 cultivation limited irrigations are sufficient there by farmer can save labour, power and quantum of irrigation water. With the same available land, more no. of dairy animals can be maintained by growing Co-3 and Co-4 varieties. All types of soils are suitable for cultivation of Co-3 / Co-4 except soils under water logging.

Farmers in urban outskirts/suburbs, started cultivation of Co-3/ Co-4 fodder varieties and getting 8 cuttings / year and earning @ ₹9000/ each harvest. In total they are getting a net income of ₹ 50,000 / acre. Farmers felt that the chaff-cutter is a must to minimize the wastage in Napier Bajra variety as the animals are leaving the stem portion. The farmers who are using the chaff cutters could get better fat percentage.

9. Cultivation practices of Co-4

Napier bajra can be planted from mid February to mid September. Planting made in dry season requires more irrigations during establishment. It does not produce viable seed. It has to be propagated vegetatively by planting cutting slips from mature stems of 2-3 nodes or rooted slips. The cuttings are planted in such a way that one node is in the soil and the other node is out side in a slanting position so that the second node which is out side soil also in contact with the soil. In this way we can get more sprouts. Rooted slips survive by 100% and cuttings have 80% survival. Spacing is 50 cm x 50 cm. But farmers follow 2'x1'. The cuttings can also be planted in plough furrow. Approximately 400 kgs of cuttings or 16,000 slips / acre are required, when planted at 50 cm x 50 cm spacing.

Fertilization

Ten cart loads of FYM may be applied per acre. An amount of 16 kg of nitrogen, 24 kg of phosphorous to applied as basal dose. After every cut 12 kg of nitrogen has to be applied. Zinc deficiency is commonly found every where. To prevent zinc deficiency 20 kg of zinc sulphate per acre should be applied or 20 g of zinc sulphate is dissolved in one litre of water and applied as foliar spray. Basal fertilization leads to more weeds. Fertilizer may be applied after 21 days preferably at the root zone i.e. in the rows but not by broadcasting. The sprouting can be observed around the week. Gap filling is to be taken up after a month. For this some of the plants which has more tillers may be completely uprooted and planted in the gaps. Gap filling should be done before the grass is ready for first cut. One row of jowar or maize can be sown in between two rows of Napier-bajra to control weeds between rows.

Legumes can be sown as an inter crop. For example 6 kgs of cowpea per acre can be sown.

Time of harvest

Usually first cut is taken at 65 to 75 days after plantation. Subsequent cuts may be taken once in 45 days. Farmers harvest for every 30 days. At this stage no chafing is required. It gives 8-10 cuttings annually.

Napier bajra possess oxalates. Oxalates combines with calcium and forms calcium oxalate which is not absorbed into the body of the animals. There by the animal suffers from calcium deficiency. So the milk yield drops. To prevent calcium deficiency mineral mixture may be fed. Co-4 is an exhaustive crop. So the crop rotation should be followed. For every three years the crop should be uprooted from the field or new plantation may be taken up in between the rows. Napier bajra is a higher yielder. It gives 140 tonnes of green fodder per acre/year.

10. Satellite Farmers Details

Name of the farmer	: R. SATTIBABU
Name of the Village	: Kalavacharla
Farm location	: Kalavacharla
Farming system	: Fodder seed production
Area under cultivation	: 2 ½ acres
Seed supplied	: 50 acres/year
Training programme	: Training under KVK SMSs
Initial Awareness about Co-4	: Through other farmers
Fodder production	: 120 tonnes / acre
No. of animals maintaining	: —
Contact No.	: 970881963

Name of the farmer	: M. RAMU
Name of the Village	: Morampudi
Farm location	: Morampudi
Farming system	: Coconut & Dairying
Area under cultivation	: 2 acres
Seed supplied	: 15 acres/year
Training programme	: Trained at KVK, Kalavacharla
Initial Awareness about Co-4	: News broadcast (AIR)
Fodder production	: 130 tonnes / acre
No. of animals maintaining	: 2 animals
Contact No.	: 9676534553

Name of the farmer	: MUTYALA RAYUDU
Name of the Village	: Gokavaram
Farm location	: Gokavaram
Farming system	: Dairy farming
Area under cultivation	: 4 acres
Seed supplied	: 5 acres/year
Training programme	: Trained at KVK, Kalavacharla
Initial Awareness about Co-4	: Through media (Television)
Fodder production	: 130 tonnes / acre
No. of animals maintaining	: 18 animals
Contact No.	: 9948707475

Name of the farmer	: RAMAKRISHNA VARMA
Name of the Village	: Dharmavaram
Farm location	: Dharmavaram
Farming system	: Fodder (Co-4)
Area under cultivation	: 3 acres
Seed supplied	: 20 acres/year
Training programme	: Trained at KVK, Kalavacharla
Initial Awareness about Co-4	: Through other farmers
Fodder production	: 130 tonnes / acre
No. of animals maintaining	: 2 animals
Contact No.	: 9848090995

Name of the farmer	: SURUKUCHI SARADHI
Name of the Village	: Mukkamala
Farm location	: Mukkamala
Farming system	: Coconut & Dairying
Area under cultivation	: 2 acres
Seed supplied	: 8 acres/year
Training programme	: Training under KVK SMSs arranged by Abhyudaya Karshak Parishad
Initial Awareness about Co-4	: Through News paper
Fodder production	: 140 tonnes / acre
No. of animals maintaining	: 12 animals

SILAGE MAKING

In *kharif* season the fodder is available in plenty, but in summer season the fodder is scarce. The fodder can be preserved by making silage without much loss of nutrients, when available in plenty. Technically, silage is a product resulting from storage and fermentation of fresh forage under anaerobic (without oxygen) conditions. The Bacteria, in the forage ferments the available carbohydrates to organic acids which causes the ensiled forage to become acidic when properly made the pH will be in a range of 3.5 to 4.5. The acids eventually kill the bacteria and preserve silage in palatable stage. As long as the silo is air tight, silage can be preserved for years.

Fermentation

It can be divided into 5 stages. The first phase takes place during first 3 to 5 days after ensiling and determine the success or failure. The first phase starts with placement of forage in the silo. The plant cells continue to produce carbon dioxide and heat in presence of oxygen, until they cease respiration and die. Heat and carbon dioxide produced during this phase reduces the air space and anaerobic conditions, which are essential for growth of bacteria. These bacteria produce organic acids. During second phase, acetic acid is the principle acid produced by bacteria.

The third phase starts with a gradual increase in lactic acid producing bacteria concurrently there is decrease in the bacteria which form acetic acid. Because they cannot live in higher levels of acidity (Produced by lactic acid producing bacteria). Settling of forage occurs in first few days. Lactic acid is the major acid produced during fourth phase, which lasts for 15 to 20 days when the acidity reaches the desired level, the bacterial action is stopped.

The events in the phase fifth depends on the results of the first four phases. If there is enough acetic acid and lactic and in this stage, no further changes takes place and silage is properly preserved. In case acid level is low, undesirable bacteria, such as butyric acid producing bacteria

grow and causes decomposition and foul smelling of silage.

Practical aspects of Silage

Suitable crops for silage: Maize is considered to be good for silage making. Sweet sudan, sorghum and mixture of legumes and non legumes are more nutritious.

Steps for silage making

- 1) Silo pits should be dug above ground water table level. In “kutchra” silo pits the sides and bottom are covered with paddy straw or any straw. This will help to maintain the silage moisture without increasing or decreasing.
- 2) The fodder crop should be harvested at proper stage. The fodder should not contain more than 65-70% of moisture (Dry matter should be about 30-35%). If the moisture is more, wilting should be done (partial drying). Silo pit measuring 2m depth and 4 m width and 30 m length can accommodate 1 ½ tonnes of silage. Seven tonnes of silage is sufficient for 3 cows for 3 months @ 20 kg/cow/day. Roughly the fodder obtained from 0.5 ac. is sufficient for the above case.
- 3) The fodder should be chaffed into small pieces preferably 1 to 2 cm
- 4) The silo pits must be filled quickly (say within 2-3 days). The chaffed fodder should be pressed tightly by trampling by labour or by animals or by tractor. This is the important step in silage making. It reduces air space and oxygen in silo.
- 5) Cereal fodder contains low protein content. So it is desirable to add urea to improve protein content at the rate of 3-4 kg per tonne by sprinkling.
- 6) Fill the chaffed material until a dome shape is achieved. This shape facilitate the drainage of rain-water, otherwise water enters the ensiled material and deteriorates the quality.
- 7) The ensiled material should be covered with a polythene sheet or with a tarpaulin or with paddy straw from all sides.

- 8) After a week, the polythene sheet or paddy straw of the top is removed and the material may be compacted again. Then cover the silage with polythene sheet or paddy straw. If straw was applied, a thick layer of moist soil 10-12 cm is spread and plastered with mud and dung.
- 9) The silage will be ready to feed by 2-3 months. Silo pit is opened to take silage through a small opening so as to reduce exposure to sun and air drying.
- 10) In the beginning, the animals will not accept the silage. So a small quantity of silage may be offered and increase gradually as per requirement.

Silage making under small farm conditions

Small size of average Indian farm (holdings) makes it difficult, if not impossible to allot a part or area for fodder cultivation and ensilage. (b) The initial cost of silo pit (cement) which is most efficient is high. (c) Chaffing is a set back for silage making as many farmers do not possess mechanical chaff cutters. (d) Lack of awareness among farmers about silage making are some of the practical weaknesses under small farmer conditions.

Where amenities are available with farmers, silage making is the best to preserve the green fodder without much loss of nutrients. The farmers may be encouraged to go for silage making.

Silage making for small farmers

The most suitable method for rural areas would be to put the chaffed fodder into silo trench of 25' x 10' x 6' near cattle shed (The trench may be prepared without plastering and bricks but the sides should be completely covered with paddy straw i.e., 5-6 cm thickness). About 350-400 tonnes) of chopped green fodder can be packed in this trench. This silage is sufficient for 4 months @ 40 kg./ head / day.

TOXIC PRINCIPLES OF FORAGES

Under certain circumstances the toxic compounds cause unthrift or even death of animals. Following are some of the toxic compounds that are present in forages.

Oxalates

Certain grasses and dry roughages have excessive salts of oxalates. 2-4% oxalates in feed cause toxicity. These compounds are probably deposited in the kidneys and damage the tissues to an extent that the animal may die.

In some plants these oxalates are in insoluble form such as calcium oxalates which are not harmful. But in some plants these occur in a soluble form i.e., potassium and sodium oxalate which are toxic to animals. Excess application of nitrogen fertilizer after each cutting of fodder results in increased oxalates content. Application of potassium fertilizer may increase the level of oxalate. Tender napier bajra grasses contains oxalates. These oxalates interfere with the absorption of calcium and phosphorus. The oxalates precipitate calcium present in the feed and fodder by forming calcium oxalates thereby the calcium will not be available to the animal. As a result the animal suffers from calcium deficiency – Hypocalcaemia.

Toxic symptoms are Salivation, abdominal pain, diarrhoea, vomiting even in ruminants. Typical symptoms include dyspnoea, with gasping and rapid respiration. Muscle tremors, staggering gait, severecynosis, sub normal temperature and death occurs usually after 12-24 hours of ingestion. Treatment : Administration of calcium borogluconate intravenously.

Nitrates

Young plants contain nitrates. Application of high doses of fertilizer leads to excessive nitrates in forages. Deficiency of sulphur in soils tends to increase nitrates. When nitrates are 0.3 to 0.4% in forages, it leads to toxicity. These nitrates when reached rumen, converted to nitrites and absorbed into blood stream. These nitrites combines with haemoglobin and forms methaemoglobin. The methaemoglobin is incapable of carrying oxygen. When the concentration of methaemoglobin reaches to 30-40%

the toxic effects are observed. To prevent nitrate poisoning, the grass should not be cut until 10-15 days after application fertilizer (N).

Clinical signs include paresis, muscle tremors staggering and final recumbency. There may be slight bloating, ruminal movements are reduced and frequent attempts to urinate. Pregnant animals are largely affected and causes abortion.

Methylene blue is the specific treatment. Dose rate is 20 mg/kg body weight injected intravenously as 1% solution.

Mimosine

It is an amino acid present in *Leucaena leucocephala* (Subabul). Prolonged and excess feeding causes toxicity. Research is going on to evolve new varieties that have less mimosine content and subjecting the leaves to different processing like silage etc. Toxic symptoms include hyper active, goiter development and still births in pregnant animals. Alopacia in sheep, Goat and Cattle are common. When the subabul is used in recommended level i.e. 30% in sheep, goat and cattle it is quite safe. In poultry ration also 7% can be included.

Hydrocyanic acid

Cynide poisoning in animals is generally caused as a result of ingestion of certain plants that are young or stunted. Wilted or trampled. These plants contain cyanogenic glycosides that can liberate toxic amounts of hydrocyanic acid (HCN) by an enzymatic hydrolysis. HCN is toxic to cattle about 2 mg/kg body weight of HCN is minimum lethal dose. The plants that possess HCN are young plants of jowar (Sorghum) Maize, Johnson grass, Tapioca sweet sudan and sugarcane.

Animal may found dead in acute cases. Rarely the animal survive more than 1-2 hours. The animal falls down with convulsions, dyspnoea, anxiety, restlessness, frothing from the mouth, dilatation of pupil, involuntary defecation and micturition, mucosa is bright red in colour. Vomiting is not a typical sign but when it is present, it may be as a result of bloating in recumbent animal and during final convulsions.

In cattle sodium nitrate 3 gms and sodium thiosulphate (Hypo) 15 grams are dissolved in 200 ml of distilled water and give intravenously. The same treatment may be repeated, if required as there may be unreleased HCN.

