

# Chaudhray Charan Singh Haryana Agricultural University Hisar (Haryana) India

Established: 1970







~0

Rajouru Mark

Elite cinernal

Sapra Multh

MANOHA

COLONY

प्रमोहर

कॉलोनी

SECTOR 15A

सेक्टर 15/

Water Works 😐

AMARDEEP

Hisar हिसार

Green Square Marke

### **Objectives of the University**



### **TEACHING**

Imparting education in different branches of study, particularly agriculture, agricultural engineering, home science and other allied sciences

### RESEARCH

Furthering the advancement of learning and research, particularly in agriculture and allied sciences





### **EXTENSION**

Undertaking the extension of such sciences to the rural people within the State





### **CCSHAU** ranked 2nd Best Agricultural University in the Country for the year 2018 by Indian Council of Agricultural Research (ICAR)



Chaudhary Charan Singh Haryana Agricultural University, Hisar ranked as 2nd 'Best State Agricultural University' amongst 67 state Agricultural University of the Country at the 91st foundation day Celebrations of the Indian Council of Agricultural



Narendra Singh Tomar.

that, the ranking is based on performance and extension.

across 33 parameters pertaining to teaching, research and extension excellence. We have delighted to have improved upon our ranking this year, but we will continue to work hard to be recognized as a top Institution not only in India, but also Internationally, for its

Research (ICAR) at New Delhi on Tuesday. The guality of teaching and research. Our aim is to University has been also ranked overall produce globally competitive manpower in Fourth (Including ICAR Institutions and State agriculture sciences who are socially and Agricultural University) in the country. The environmentally responsible" To improve the Awards were presented by Union Minister of socio-economic status of the farming Agriculture and Farmers' Welfare Sh. community university would work with renewed vigorous and vitality to fulfill the

Prof. K. P. Singh, Vice-Chancellor, told mandate in the area of academics, research

#### **ICAR Top Ten Ranking**

- ICAR-National Dairy Research Institute, Karnal
- ICAR-Indian Agricultural Research Institute, New Delhi
- 3. G.B.Pant University of Agriculture & Technology, Pantnagar
- Chaudhary Charan Singh, Haryana Agriculture University, Hisar
- ICAR-Indian Veterinary Research Institute, Bareilly
- Prof. Jayashankar Telangana State Agricultural University, Hyderabad
- Punjab Agricultural University, Ludhiana 7.
- Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana
- Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur
- 10. Indira Gandhi Krishi Vishwavidyalaya, Raipur





**Total No. of Varieties 238** 

Н



Energy production vis-à-vis biomass yield evaluation of different fodder crops/ grasses/hybrids (with confirmed paternity using DNA profiles) in *Kharif* season in India



Dr. Y. Jindal yjindalhau@gmail.com Assistant Director (REL) Directorate of Research, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar 125 004, Haryana, India

INSPIRING AGRIPRENEURS

10/15/2019

# MANDATE



Development of high yielding varieties of forage crops possessing wider adaptability, better nutritional quality and resistance to insect-pests and diseases

Development of dual purpose and multicut varieties of different forage crops viz. Forage Sorghum, Berseem and Oats

To disseminate the improved varieties and technologies among the farmers

To work out the optimum agronomic practices for the cultivation of various forage crops under different farming systems

To increase the forage production per unit area and per unit time under Haryana conditions

# INTRODUCTION



INSPIRING AGRIPRENEURS

Haryana is located in the northwest part of the country and the climate is arid to semi arid with average rainfall of 455 mm.

Around 70% rainfall is received during July to September and the remaining 30% during Dec. to Feb. There are two agro climatic zones in the state.

### **Agro-climatic zones of Haryana**





### Temperature, Rainfall and Climate Zones of Haryana









### 10/15/2019





H

Α

### Area under Green Fodder Crops in Haryana

Area

**Unirrigated** (B)

10156

2088

27

52

394

66501

79218



**Area in hectares** 

**Total** 

(**A**+**B**)

73116

363

28

4627

1236

4190

51273

9771

246204

390808

Crop **Irrigated** (A) NSPIRIN Sorghum 62960 Maize 363 **Pearl millet** 28 G Sesbania 2539 AG Trigonella 1209 RIPR Oats 4138 50879 Berseem ĒZ 9771 Lucerne EU **Other fodders** 179703 RS **Total** 311590

Source: DGLR (Hry.)

IEUR

S

# **Animal Population in Haryana**



- The livestock sector in India contributes to nearly 32% of total agricultural output
  India with 2.3% share of global geographical area supports nearly 20% of the livestock population of the World, notably among them are cattle (16%), buffalo (55%), goat (20%) and sheep (5%).
- •Having only 4% of total cropping area under fodder cultivation has resulted in a severe **deficit** of green fodder (36%), dry fodder (40%) and concentrates (57%).
- Haryana has a livestock population of 9.1 million
- Its 'Hariana' breed of cows and 'Murrah' breed of buffaloes are known throughout the world
- Buffaloes constitute 67% of the total livestock population and they contribute about 80% of the total milk production in the State.

### Summary of Quick Tabulation of 18th Livestock Census



Η

	Cattle	Βι	uffalo	Sheep		
	15,52,36	1 59,	53,228	6,01,37	9	
	Goa	t Hors	ses Po	nies	Mule	
	5,38,3	20 21,0	94 4,7	740 1	L0,600	
Donkeys		Camel	Pig			
4,838		38,608	1,33,5	21		
		Dog	Total Live	stock	Total Poul	try
		1,91,450	90,50,1	.39	2,87,85,49	97







### **Largest Livestock Population**

•	<b>Buffaloes:</b>	96.6	million	(57%)-	nearly	all	breeds:
		numb	pering 8.		Haryana	0 million	



Cattle:	187.4 million (14%) – 40 breeds : One
	seventh in the world Haryana – 1.5 million



Goats:	120.1 million -	- 20	breeds:	one-sixth	in the
	world		Harya	ana – 0.46 i	million











The richest animal resource in the world

DEPARTMENT OF ANIMAL HUSBANDRY & DAIRYING, HARVANA





#### Kharif crops

Sorghum (Sorghum bicolor), Cowpea (*Vigna unguiculata*), Guar (*Cyamopsis tetragonoloba*), Maize (*Zea mays*), Pearl millet (*Pennisetum glaucum*), Teosinte (*Euchlaena mexicana*)

### Rabi crops

Berseem (Trifolium alexandrinum),

Oats (Avena sativa),

Lucerne (*Medicago sativa*)

Rye Grass (Lolium spp.)

Fodder Beet

Chinese cabbage (Brassica pekinensis).

Perennial crops (on trial)

Bajra Napier Hybrid, Clitoria ternatea, Pennisetum hybrid Cenchrus ciliaris Consol and Consol and



### Kharif crops

Sorghum (Sorghum bicolor)

Pearl millet (Pennisetum typhoides)

Cowpea (Vigna unguiculata)

Rabi crops

Berseem (Trifolium alexandrinum)

Oats (Avena sativa)



**Experiment:** The experiments comprising a few genotypes of each crop were conducted under **five** different agro-ecological zones of India viz. North West Zone, South Zone, Hill Zone, North East Zone and Central Zone during different *Kharif* seasons. Around **25 locations** data has been taken.

The data **of different crops** along with the checks have been recorded. The experimental details are given below:

Genotypes	:	vary	
Replications	•	3-7	
Plot Size	:	4m x 3	3m
Experimental	Design	:	RBD

# MATERIALS & METHODS



**Observations:** The observations were recorded on the following characters: ■Green Fodder Yield (q/ha)

- Dry Matter Yield (q/ha)
- Production efficiency: Green Fodder Yield (q/ha/day)
- Production efficiency: Dry Matter Yield (q/ha/day)
- Plant height (cm)
- Leaf length (cm)
- Number of tillers per plant
- Dry Matter %
- Crude Protein %
- Crude Protein yield (q/ha)
- In vitro dry matter digestibility (IVDMD %)
- Dry digestible matter (DDM) Yield (q/ha)

# Annual Crops (Cereals and Legumes)





INSPIRING

AGRIPRENEURS

C<sub>1</sub>- Sorghum (*Sorghum bicolor*)



C<sub>2</sub>- Pearl millet (*Pennisetum americanum*)



C<sub>3</sub>- Maize (Zea mays)



C<sub>4</sub>- Cowpea (*Vigna unguiculata*)



C<sub>5</sub>- Rice bean (*Vigna umbellata*)

# Perennial hybrids/grasses





C<sub>6</sub>- Bajra Napier Hybrid (Pennisetum americanum x P. purpureum)



C<sub>8</sub>- Cenchrus ciliaris



C<sub>7</sub>- *Pennisetum* Hybrid (*P. glaucum x P. squamulatum*),



C<sub>9</sub>- Cenchrus setigerus

# Perennial hybrids/grasses





C<sub>11</sub>- Setaria Grass (Setaria parviflora)



C<sub>12</sub>- Desmanthus

 $C_{13}$ - Dichanthium annulatum









#### Dry Matter %



Η

A

U







CPY
 CP%

H

A U

INSPIRING AGRIPRENEURS

Η

A U





### **Digestible Crude Protein**





H



Η



#### Quality traits analysis in different crops







H

A



#### **Net Energy for Growth (Mcal/lb)**



# CONCLUSIONS



•Green fodder and dry matter yields were Maximum in Bajra napier hybrid followed by Setaria and Desmanthus due to their multi cut nature.

- •It may solve the problem possibility in 2020 to increase the production of biomass with 10 million tons? We need superior genotypes with high yielding varieties of forage crops possessing wider adaptability, better nutritional quality and resistance to insect-pests and diseases.
- **Production efficiency** was observed to be highest in Bajra napier hybrid followed by Sorghum and pearl millet
  - How much vigourous these crops needs to mature or to reach at 50% flowering stage beneficial for the animals.
- **Tallest plants** with high biomass were observed in Sorghum followed by maize and pearl millet the more taller the plant better will be its biomass but on the other hand it will be prone to lodging. More height of the plants was may be due to the high input intake by the plants.
- Leaf stem ratio was found to be highest in Cenchrus setigerus crop due to its leafy behaviour
  - Leaf : stem ratio increase was mainly due to increase in the foliage that utilized the solar energy in the production of photosynthates ending in higher biomass production.
- Dry matter % was observed highest in pearl millet followed by Pennisetum hybrid
  - The highest DM% is due to characters like plant height and leaf : stem ratio.

## CONCLUSIONS



- Crude protein % was observed highest in Clitoria ternatea followed by Cowpea both are legume crops
   Higher crude protein per cent may be due to more nitrogen accumulation and its conversion to the protein in the particular genotype.
- Crude protein yield (q/ha) was highest in Desmanthus followed by *Clitoria ternatea* and bajra napier hybrid due to high dry matter observed in these crops.
  - •Higher crude protein yield may be due to increased photosynthetic activities leading to higher cell division and elongation of the cells that resulted in accumulation of more photosynthates, leading to higher dry matter production which ultimately resulted in higher crude protein production.
- **Digestible crude protein** the amount of crude protein actually absorbed by the animal (crude protein minus the protein lost in feces). It was highest in cowpea, *Clitoria ternatea* and Desmanthus.
- In vitro dry matter digestibility (IVDMD%) was highest in Pearl millet, Cenchrus ciliaris and Dicanthium annulatum.
  - •Higher IVDMD per cent was desirable and it was mainly due to less lignin content as observed in ADF per cent. Moreover, IVDMD primarily depends upon the concentration of cellulose and hemicelluloses, which in turn is influenced by the degree of lignification, silicification (Van-Soest and Jones, 1968) and fibre components (Luthra *et al., 1988). A strong negative* correlation exists between lignin concentration and digestibility of tropical forages



- Higher Dry matter digestibility (q/ha) was observed in bajra napier hybrid, sorghum and pearl millet.
  - Higher DDM was desirable and it might be due to high IVDMD% and dry matter yield
- Low Acid Detergent Fiber (ADF) % was observed in Sorghum, pearl millet and *Clitoria ternatea*. Lower ADF per cent is desirable and it might be due to low lignin content.
  - It is the fibrous, least-digestible portion of roughage. ADF consists of the highly indigestible parts of the forage, including lignin, cellulose, silica and insoluble forms of nitrogen. Roughages high in ADF are lower in digestible energy than roughages that contain low levels of ADF. As ADF levels increase, digestible energy levels decrease.
- Neutral Detergent Fibre (NDF) % is commonly called "cell walls". It was lowest in *Clitoria ternatea* and Desmanthus.
  - •Lower NDF per cent is desirable and it might be due to low hemicellulose. NDF digestion can be attributed to lignin which in association with cell walls limits microbial degradation. Neutral detergent fibre has been shown to be negatively correlated with dry matter intake.
- Relative feed value was highest in bajra napier hybrid, pearl millet and rice bean.
  - a way to compare the potential of two or more like forages for energy intake. Relative feed value is an index of forage quality

### CONCLUSIONS



- Total Digestible Nutrients (TDN): Its values are almost similar in all cases as the values depended on ADF% and it moves in a narrow range.
  - •TDN values are usually quoted as percentages for feeds and as amounts per day for requirements. The sum of the digestible fiber, protein, lipid, and carbohydrate components of a feedstuff or diet. TDN is directly related to digestible energy.
- •Net Energy used for Maintenance (Nem, Mcal/lb) Energy required for Breathing, Walking, etc. It is highest available in sorghum followed by Clitoria ternatea and Desmanthus.
- Net Energy for Growth (NEg Mcal/lb) It is highest available in sorghum followed by Clitoria ternatea and Desmanthus.
  - NEg of a feed measures the ability of the feed to meet the **energy** requirements for gain. Energy for Muscle and Bone Production
- Net Energy for Lactation (NEI Mcal/lb) energy for lactation (NEI) in milking cows. It is highest available in sorghum followed by Clitoria ternatea and Desmanthus.

In this experiment conducted over 25 locations across the length and breadth of India, thirteen crops (five annual and 8 perennial crops/hybrids/grasses) were evaluated. Different conclusions are drawn which can be of immense help in deciding strategy for growing fodder crops as per the climatic and geographical conditions. Objectives can be achieved by carefully selecting the crops in comparison to nature of livestock.



### CHAUDHARY CHARAN SINGH HARYANA AGRICULTURAL UNIVERSITY, HISAR





www.hau.ac.in



V VV

Twitter link:- https://twitter.com/ccshauofficial



Google+ link:- https://plus.google.com/communities/ 103255560738264147372



Facebook link:- https://www.facebook.com/Chaudhary-Charan-Singh-Haryana-Agricultural-University-Hisar-1073782446062928/



YouTube link:- https://www.youtube.com/channel/ UCoHPHYtc3-9AC20oOMaBQzw?view\_as=subscriber



**Blogger link:-** https://ccshauofficial.blogspot.com/



Instagram link:- https://www.instagram.com/ccshauhisar/



WhatsApp Groups:- Emausamhau (9416995529) and HAU Crop Resi. Mang. Grp. (8683082401)

