

FORAGE CROPS AND GRASSES

S. C. PANDA



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AGROBIOS (INDIA)

Published by:

AGROBIOS (INDIA)

Agro House, Behind Nasrani Cinema

Chopasani Road, Jodhpur 342 002

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AGROBIOS (INDIA)

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ISBN No. (13): 978-81-7754-543-2

Published by: Dr. Updesh Purohit for Agrobios (India), Jodhpur

Laser Typeset at: Yashee Computers, Jodhpur

Cover Design by: Reena

Printed at: Babloo Offset, Jodhpur



AT THE FEET OF LORD
SHREE JAGANNATH
PURI, ORISSA

DEDICATED TO MY FATHER,
SHYAM SUNDAR PANDA
AND MOTHER,
SHNEHALATA PANDA



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FOREWORD

"There is no greatest happiness than knowledge. Knowledge stretched – is book"

Livestock population in the Eastern and North Eastern region of India is mainly dependent on forage resources deriving from crop residues, grazing from natural pasture and to some extent cultivated perennial fodder crops. There is acute shortage of both green and dry fodder. Orissa owing to its peculiar agro-ecological situation and socio economic status of farmers has dismal forage production from cultivated area. In Orissa, there is a deficit of 61.48% green fodder and surplus of 46.70% by dry fodder respectively. The per capita availability of milk in Orissa is **only 94 gday'** (2004-05) as against **ICMR recommended minimum requirement of 210 gday'** (Anonymous, 1996-97). Besides the cost of production of milk is gradually taking an upward trend due to increase in cost of cattle feed. The dairy farmers are hardly using quality green fodder for their animals, resulting in not only increased cost of production of milk but also increased health maintenance. The situation can only be improved by adopting a suitable food-fodder cropping system, which in turn may meet the demand of livestock population for better health, nutrition and higher production and the human beings with better nutritional qualities and sustainable dairy farming.

The agricultural prosperity of India is intimately bound up with adequate nutrition of the cattle, which provide the principal motive power in Indian farming. Fodders are derived mainly from straws of cereals grown for grain and from plant residues of pulse crops and other legumes. However, some cereals and some legumes are grown exclusively for green or dry fodder. Growing of fodder as a part of the normal crop rotation is practiced in a varying degree in most of the states and particularly in tracts famous for dairy farming or cattle breeding. The cultivation of nutritive fodder crops has gained increasing importance in recent years due to the rapid diminution of grasslands and pasture areas, the expansion of dairy industry and the greater need for better, healthier and well-fed work cattle.

From time immemorial, mankind has been struggling hard to get the maximum yield per unit area per unit time. In modern times, this struggle takes the form of multiple cropping, intensive cultivation of high yielding varieties, integrated farming and mixed cropping with a view to keeping land,

labour, capital and other resources occupied for the maximum period during the year, maintaining their productive efficiency at the highest level and thereby, attaining the highest yields in terms of agricultural production as well as return on the resources employed. In fact, multiple cropping, intensive cultivation, mixed cropping and integrated farming are interrelated and have to be viewed together.

The future of Indian agriculture depends on the development of appropriate farming system as applicable to resource poor farm families and as suited to different agro-ecological zones. Restricting the use of purchased inputs in farming could be achieved through multiple cropping and diversified farming including animal husbandry, forestry, dairy, duckery, fisheries, apiary, sericulture, etc. The demand must be met from limited resources such as land, water, energy and labour. Increasing food supplies with limited natural resources is a great challenge to the scientific communities. Under this situation, Integrated Farming System (IFS) seems to be the answer, considering the current scenario in agriculture in India. Besides, facilitating cash income and increased employment opportunities, Integrated Farming Systems minimize the quantum of purchased inputs in farming by effective recycling of products and by-products among the component enterprises, reduce the ill effects of inorganic fertilizers and chemicals (pesticides, herbicides etc.) or pollution hazards. Integrated farming system is not only a reliable way of obtaining fairly high productivity with substantial fertilizer economy, but also a concept of ecological soundness leading to sustainable agriculture.

Integrated farming system will generate appreciable employment potentialities providing more man-days in a year. Even for the educated persons particularly agricultural graduates, such farming systems are likely to be more profitable than white collar jobs thus partially reducing the job demands by the graduates. As a whole, such system will increase production of agriculture in the state, particularly, fruits, vegetables and produce from dairy, poultry, duckery and fishery which are of very much shortage in the state.

The scenario in food production is changing fast in the country with the advances made in all branches of Agricultural Sciences. However, the science of Agronomy, a specialised subject dealing with all aspects of field crop production, has accelerated the pace of food production, aided by the progress made in understanding the intricate relationships between crop growth and yield, and between crop and its environment of climate, soil, biotic factors, and management practices. Here, the post-Independent era has seen a four-fold increase in food production and currently it is over 175 million tonnes. The ushering of the Green Revolution in the country through introduction of improved high yielding varieties and hybrids particularly of Maxican dwarf wheat hybrid, hybrid sorghum and maize and HYVs of rices derived from parental material from the International Rice Research Institute, **Philippines in nearly 1960's brought its wake an array of new techniques in** crop production aimed at optimising plant population, crop geometries, soil fertility management and weed as well as pests and diseases containment.

The science of Agronomy has made it possible to generate suitable technology for varied agro-climatic regions and integrate the results of other allied sciences, so as to deliver these appropriate innovative and tested practices to the farmers at large.

The author presented the book entitled, "**Forage Crops and Grasses**" in a scientific and systematic manner to understand the fundamentals clearly and easily which is the beauty of this book. Potential yield can only be achieved under ideal management in an optimal physical, chemical and biological environment. Farming Systems represent integration of farm enterprises as cropping systems, animal husbandry, fisheries, poultry farming, etc. for optimal utilization of resources bringing prosperity to the farmers. A judicious mix of cropping systems with associated enterprises like dairy, poultry, piggery, fishery, sericulture, etc. suited to the given agro-climatic conditions and socio-economic status of farmers would bring prosperity to the farmer.

I am confident that this book will serve as a reference book for agronomy, soil science, horticulture, extension education and veterinary students, research scientists and teachers in the areas of crop production, soil management, weed management organic farming, integrated farming systems, cropping systems, production technology management under different situations, soil fertility management, avian and animal sciences. This book will also serve as a guide to the extension officials of the department of agriculture. I congratulate Dr. S. C. Panda for his pains taking effort in bringing out this book of weed management covering the latest technologies for crop production associated with integrated enterprises in farming systems to meet the growing interest in sustainable agriculture. I am confident that this book will be widely accepted among the students. I extend my best wishes to Dr. Sharat Chandra Panda for the success of this book.



Bhubaneswar
Date: 23.5.2014

Dr. Bhagabat Panda

Preface

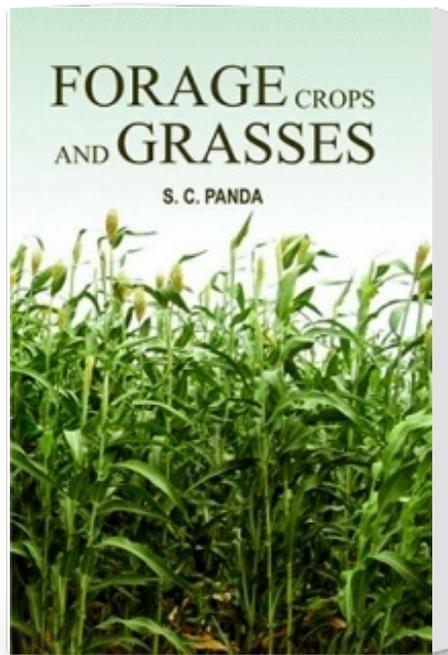
“Butterfly keeps flying from one flower to another in search of nectar without losing enthusiasm. Similarly, one should never lose enthusiasm as it is the only force, which drives people to perform at their best and allows them to achieve the worthiest of causes”

Agriculture has been and will continue to be the life line of the Indian economy. **India’s food and economic security continues to be dependent** upon the agriculture sector. India supports 16% of the world human and **17% of the livestock population on 4.2% of the world’s water resources**, 2.4% global area and 0.5% grazing land. The per capita availability of resources is about 4 to 6 times less as compared to the world average. There is every possibility of future decrease in per capita availability of resources due to increasing demographic pressure causing land diversion for non-agriculture use.

Orissa, like India is also suffering from bulging population of human beings as well as live stock. To feed the live stock, our state has a requirement of 43.88 metric tons of green and 42.48 metric tons of dry fodder, respectively. The available green and dry fodder has been estimated to be approximately 16.29 metric tons and 62.32 metric tons, respectively. There is a deficit of 61.48% and surplus of 46.70% of green and dry fodder, respectively. Hence, to meet the demand of both the human and live stock population the food-fodder cropping system is the need of the present day. This will ensure higher production, productively and better nutritional qualities of both food and fodder as compared to the present traditional system of mono-cropping.

Cowpea [*Vigna unguiculata* (L) Watp] is an important fodder legume grown during *kharif*, pre-rabi and summer seasons. It is grown mainly for fodder either as a pure crop or intercropped with seasonal fodder viz. maize, sorghum, pearl millet or perennial fodder i.e., napier-bajra-hybrid for enriching their nutritive value, because of its higher protein content. Besides, it also fixes atmospheric nitrogen in soil and reduces the nitrogen need of the succeeding crop. In recent days it is also grown as a pre-kharif fodder crop to supply green fodder during scarcity. Optimum plant population is required for achieving the potential yield. Too close a spacing will have the overcrowding, and wider spacing reduces the plant population. The optimum

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Publisher : Agrobios Publications ISBN : 9788177545432

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