

RESEARCH ARTICLE

Response of tef (*Eragrostis tef* (Zucc.) Trotter) yield to nutrient management under rainy and irrigation production systems in northwestern Amhara, Ethiopia

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Abstract

Crops respond differently to soil nutrients because of climate, soil, and management. This study aimed to determine the most important nutrients for tef production. The experiment was conducted over two production seasons. All (NPKS₂ZnB), All-B, All-Zn, All-S, All-K, All-P, All-N, RNP, RNP+Sx1, and no fertilizer treatments were applied. The pre-planning soil status of the study sites, available P concentrations during the rainy season are between 5.1 and 8.9 mg kg⁻¹, however, 21.4 mg kg⁻¹ of available P is observed during irrigation. In rain-fed production systems, the mean soil N concentrations are 0.12% in nitisols and 0.15% in vertosols, whereas in irrigation production systems, it is 0.14% in nitisols. The grain yield significantly ($p \leq 0.01$) varied with the omission of nutrients during the production season. However, there was no significant ($p < 0.05$) decrease in yield due to the omission of K₂S₂O₈ nutrients. The lowest mean grain yields of 342 kg ha⁻¹ (nitisols) and 491 kg ha⁻¹ (vertosols) were obtained from the no fertilizer treatment. Nitrogen omission decreased yields by 49 and 65% in nitisols and vertosols under the rainy season, respectively, whereas a 19% yield decrease was also observed in the irrigation season. A 10% yield decrease was observed from the P omitted treatment in the rainy season. Thus, N is the primary limiting nutrient to yield in both production seasons, while P is also a yield-limiting nutrient in nitisols. Thus, the government should import the right kind of fertilizer to boost crop productivity in Ethiopia. The required plant nutrients should be periodically monitored in farming systems.

Introduction

Maintaining soil resources while meeting the food demand of the growing population is an unsolved problem [1]. Chemical fertilizer has played a major role in global food production over the past 60 years to feed the ever-increasing population. The current challenge for the Ethiopian agricultural sector is low productivity due to a high level of nutrient mining, low use

Tef Production Manual

I. K. Das,P. G. Padmaja



Tef Production Manual:

Manual of Nutritional Therapeutics, 2008 Now updated this quick reference provides practical evidence based recommendations for nutrition of healthy individuals nutritional support of hospitalized patients and dietary management of patients with diabetes renal disease cancer and AIDS **1976 NASA Authorization** United States. Congress. House. Committee on Science and Technology, 1975 **Alternative Feed Ingredients for Sustainable Livestock Production** Juana Catarina Cariri Chagas, Gabriel Da Silva Viana, Marcos Inacio Marcondes, 2025-08-12 Population growth and rising incomes in developing countries are leading to an increasing demand for animal products As limited possibilities exist to increase the area of arable land food production depends on an increase in crop yield per hectare However more than 70% of global agricultural land is already used to produce feed to support livestock production Moreover the remaining arable land available is used for food and fuel and in the upcoming years due to the consequences of climate change and global warming some of this land will be compromised through droughts and desertification Therefore using ingredients such as non human edible products native crops and by products in animal feed is necessary and unavoidable **Handbook of Quality Integrated Circuit Manufacturing** Robert Zorich, 2012-12-02 Here is a comprehensive practical guide to entire wafer fabrication process from A to Z Written by a practicing process engineer with years of experience this book provides a thorough introduction to the complex field of IC manufacturing including wafer area layout and design yield optimization just in time management systems statistical quality control fabrication equipment and its setup and cleanroom techniques In addition it contains a wealth of information on common process problems How to detect them how to confirm them and how to solve them Whether you are a new enginner or technician just entering the field a fabrication manager looking for ways to improve quality and production or someone who would just like to know more about IC manufacturing this is the book you re looking for Provides a readable practical overview of the entire wafer fabrication process for new engineers and those just entering this complex field Enables engineers and managers to improve production raise quality levels and solve problems that commonly occur in the fabrication process Presents the latest techniques and gives special attention to Japanese IC manufacturing techniques showing how they obtain outstanding quality *Sesame: Sustainable Production and Applications* Sapna Langyan, Pranjal Yadava, Rashmi Yadav, Rakesh Bhardwaj, 2025-04-18 This edited book systematically discusses the advances in biotechnology agrotechnology and food technology in shaping sesame production cultivation and uses to meet the future needs Sesame *Sesamum indicum* is the oldest oilseed crop known to humans It has been recognized as one of the most nutritious and health supportive crops with several applications in food cosmetics and health products A wide variety of sesame is grown throughout the world primarily in Asia and Africa It s seed and seed oil is being used widely in diverse cuisines It is also used in cosmetic and health products Advances in biotechnology agrotechnology and food technology in redefining sesame production and uses are of great importance Various new advanced technologies have been employed to

develop high yielding and disease resistant sesame varieties for better cultivation seed production and for utilization of seeds and seed oil in a lot of foods cosmetic and health products This book provides an overview of different advanced technologies their mechanisms and their effect on the quality of the sesame crop and sesame seeds oil The book also emphasizes the assessment of advanced technology on its limitations and advantages This book offers the latest research on techniques applications and challenges of producing quality sesame crop with recommendations towards sustainable agriculture The book is a valuable resource for students researchers and scientists working in the field of sesame production and applications Industry experts involved in development and management of sustainable production technologies will also find the book beneficial

Space Benefits: the Secondary Application of Aerospace Technology in Other Sectors of the Economy

, **Handbook of Research on Mango Fruit** Sajjad Hussain,Kamrun Nahar,Ishtiaq A. Rajwana,Sezai Ercisli,Shakeel Ahmad,2025-11-11 Here is a comprehensive resource on all aspects related to mango one of the most beloved and economically significant tropical fruits globally This book provides a thorough exploration of the multifaceted world of mango covering postharvest science production practices nutritional aspects and cutting edge processing technologies This 700 page handbook first begins with mango cultivation and production varietal diversity of mangos and sustainable approaches to mango farming Addressing the continuing demand for mangoes worldwide the volume also takes an in depth look at postharvest practices delving into the intricate processes that influence the quality shelf life and marketability of mango fruit From harvesting techniques to storage methods the chapters offer valuable insights into preserving the freshness and nutritional content of mangoes from orchard to consumer *1976 NASA Authorization, Hearing Before...., 94-1... United States. Congress. House Science and Technology Committee,1975*

Advances in Haploid Production in Higher Plants Alisher Touraev,Brian P. Forster,Shri Mohan Jain,2008-12-18 The importance of haploids is well known to geneticists and plant breeders The discovery of anther derived haploid *Datura* plants in 1964 initiated great excitement in the plant breeding and genetics communities as it offered shortcuts in producing highly desirable homozygous plants Unfortunately the expected revolution was slow to materialise due to problems in extending methods to other species including genotypic dependence recalcitrance slow development of tissue culture technologies and a lack of knowledge of the underlying processes Recent years have witnessed great strides in the research and application of haploids in higher plants After a lull in activities drivers for the resurgence have been 1 development of effective tissue culture protocols 2 identification of genes controlling embryogenesis and 3 large scale and wide spread commercial up take in plant breeding and plant biotechnology arenas The first major international symposium on Haploids in Higher Plants took place in Guelph Canada in 1974 At that time there was much excitement about the potential benefits but in his opening address Sir Ralph Riley offered the following words of caution I believe that it is quite likely that haploid research will contribute cultivars to agriculture in several crops in the future However the more extreme claims of the enthusiasts for haploid breeding must be treated with proper caution

Plant breeding is subject from time to time to sweeping claims from enthusiastic proponents of new procedures Human Stem Cell Manual Suzanne Peterson, Jeanne F. Loring, Robin L. Wesselschmidt, Philip H. Schwartz, 2011-10-10 Stem cells are self replicating and undifferentiated meaning their function is not yet cell tissue or organ specific Due to the unique nature of these cells research into their biology and function holds great promise for therapeutic applications through replacement or repair of diseased and damaged cells This reader friendly manual provides a practical hands on guide to the culture of human embryonic and somatic stem cells By presenting methods for embryonic and adult lines side by side the authors lay out an elegant and unique path to understanding the science of stem cell practice The authors begin with a broad based introduction to the field and also review legal and regulatory issues and patents Each experimental strategy is presented with an historical introduction detailed method discussion of alternative methods and common pitfalls This lab guide for researchers also serves as a textbook for undergraduate and graduate students in laboratory courses Millets and Sorghum Jagannath V. Patil, 2016-12-20 Millets and sorghum are extremely important crops in many developing nations and because of the ability of many of them to thrive in low moisture situations they represent some exciting opportunities for further development to address the continuing and increasing impact of global temperature increase on the sustainability of the world's food crops The main focus of this thorough new book is the potential for crop improvement through new and traditional methods with the book's main chapters covering the following crops sorghum pearl millet finger millet foxtail millet proso millet little millet barnyard millet kodo millet tef and fonio Further chapters cover pests and diseases nutritional and industrial importance novel tools for improvement and seed systems in millets Millets and Sorghum provides full and comprehensive coverage of these crucially important crops their biology world status and potential for improvement and is an essential purchase for crop and plant scientists and food scientists and technologists throughout the developed and developing world All libraries in universities and research establishment where biological and agricultural sciences are studied and taught should have copies of this important book on their shelves **Space Benefits** United States. National Aeronautics and Space Administration. Technology Utilization Office, 1975 **Life Cycle & Technoeconomic Modeling** Antonio Colmenar Santos, David Borge Diez, Enrique Rosales Asensio, 2020-12-02 This book aims to perform an impartial analysis to evaluate the implications of the environmental costs and impacts of a wide range of technologies and energy strategies This information is intended to be used to support decision making by groups including researchers industry regulators and policy makers Life cycle assessment LCA and technoeconomic analysis can be applied to a wide variety of technologies and energy strategies both established and emerging LCA is a method used to evaluate the possible environmental impacts of a product material process or activity It assesses the environmental impact throughout the life cycle of a system from the acquisition of materials to the manufacture use and final disposal of a product Technoeconomic analysis refers to cost evaluations including production cost and life cycle cost Often in order to carry out technoeconomic

analysis researchers are required to obtain data on the performance of new technologies that operate on a very small scale in order to subsequently design configurations on a commercial scale and estimate the costs of such expansions The results of the developed models help identify possible market applications and provide an estimate of long term impacts These methods together with other forms of decision analysis are very useful in the development and improvement of energy objectives since they will serve to compare different decisions evaluating their political and economic feasibility and providing guidance on potential financial and technological risks

Technology of Functional Cereal Products B R Hamaker,2007-11-08 Cereal grains and their fractions contain many health protecting compounds such as phytochemicals vitamins and indigestible carbohydrates but the texture and taste of functional cereal products can be less than ideal This important collection reviews technologies for producing a wide range of cereal products with different health promoting properties and more acceptable sensory quality The first part of the book discusses the health effects of cereals with chapters on topics such as whole grain foods cereal micronutrients and resistant starch Consumer perception of health promoting cereal products and regulatory and labelling issues are also described The second part focuses on technologies to improve the quality of functional cereal products reviewing issues such as grain improvement novel cereal derived ingredients and formulation of low GI products Chapters dedicated to a wide range of product types are also included covering cereal foods made from oats rye barley and speciality grains and breads fortified with vitamins and minerals soy and omega 3 lipids among others Technology of functional cereal products is an essential reference for all those involved in research and development of health promoting cereal based foods Reviews technologies for producing a wide range of cereal products Discusses the health effect of cereals including whole grain foods and cereal micronutrients Describes consumer perception of health promoting cereal products

Minor Millets Dinesh Chandra Joshi,Amit Kumar Singh,Salej Sood,Manoj Prasad,2025-05-14 This book on minor millets provides a detailed account of their crop biology agronomy genetics breeding genomic resources production constraints and value addition The potential of minor millets in addressing food and nutritional insecurities is well recognized Government of India declared millets as Shree Anna as they are a powerhouse of nutrients and possess strong climate resilience properties Minor millet species such as finger millet foxtail millet barnyard millet little millet proso millet kodo millet fonio millet and teff are the oldest cultivated crops that are used for both food and fodder in semi arid regions of Asia and Africa In the recent times they have become important due to their unparalleled nutritional profile recognized nutraceutical properties versatile environmental adaptability and ability to flourish in low input agriculture and organic cultivation However their cultivation and consumption are declining due to lack of awareness and unavailability of literature to a broad range of audience This book serves as reference material for researchers and students engaged in genetic improvement biochemistry processing and value addition of minor millets

Advancement of Science and Technology in Sustainable Manufacturing and Process Engineering Kibret Mequanint,Assefa Asmare Tsegaw,Zenamarkos Bantie Sendekie,Birhanu Kebede,Ephrem Yetbarek

Gedilu,2023-12-12 This book presents current research on sustainable development issues and recent manufacturing and process engineering advances Topics covered range from postharvest technologies to sustainable utilization of natural resources and supply chain integration to the design of renewable energy systems The book provides researchers engineers industry professionals graduate students and practitioners with state of the art research on the efforts being made toward sustainability in developing countries **Handbook on Sourdough Biotechnology** Marco Gobetti,Michael

Gänzle,2023-04-24 Bread and leavened bakery products have been essential to human nourishment for millennia Traditionally bread production has relied on the use of sourdough as a leavening agent and to impart a characteristic quality to baked goods In recent years improved understanding of the biodiversity and microbial ecology of sourdough microbiota the discovery of new species the improved management and monitoring of its meta community and the commercialization of innovative products have vastly expanded the potential of sourdough fermentation for making baked goods For example raw materials such as cereals pseudo cereals ancient grains and gluten free substrates as well as a large number of baked good varieties e g typical and industrial breads sweet baked goods gluten free products may benefit from advances in sourdough fermentation In addition biotechnological tools and culture properties have been discovered to improve both the shelf life and the sensory and textural qualities of baked goods as well as their nutritional and health promoting properties Now in its second edition the Handbook on Sourdough Biotechnology remains the only book dedicated completely to sourdough biotechnology with the contribution of the most experienced researchers from the field It reviews the history of sourdough and the potential of sourdough fermentation in the production of bread and baked goods A thorough discussion of the various processing steps includes the chemical properties of the raw matter the taxonomy diversity and metabolic properties of starter yeasts and lactic acid bacteria and the effects of sourdough fermentation on the shelf life and the sensory textural nutritional and health promoting properties of baked goods Millets: Crops for Climate Resilience and for Food and Nutritional Security Stanislaus Antony Ceasar,Suprasanna Penna,Carlos W. Piler Carvalho,Shri Mohan Jain,2025-09-30 This

edited volume discusses each millet its climate resilience and nutrition supplementation properties in detail and help to understand and think forward the future studies Millets often called Nutri cereals are easily digestible gluten free having low glycemic index and are high in antioxidants The ever changing global climate and water shortages also direct humans to look for alternative food for stable cereals like rice Millets are a good fit for harsh climates especially water and fertilizer shortages The major reasons for decrease in the consumption of millets are the lack of production techniques lack of awareness of nutritional merits and lack of processing technologies of millets It has become imperative to reorient the efforts on the millets crop to generate demand through value addition of processed foods nutritional evaluation and creation of awareness so that human and animal health can be maintained sustainably Millets have the potential nutritional pharmaceutical properties that fulfill the requirement of the habitat and obviate dependence on major food crops Millets will

become alternative crops to feed ever growing new mouth to feed This book provides a comprehensive source of theoretical and practical updates about climate resilience and the nutrition supplementation roles of millets It also covers the production marketing and value added product development of millets This book is a valuable resource for scientists teachers agriculturists capacity builders the food industry and policymakers and will serve as additional reading material for undergraduate and postgraduate students of life science *Biotic Stress Resistance in Millets* I. K. Das,P. G.

Padmaja,2016-08-03 Biotic Stress Resistance in Millets presents an important guide to the disease and pest related challenges of this vital food crop Biotic stresses are one of the major constraints for millet production but newly emerging and forward thinking problems with disease and insect pests are likely to increase as a result of changing weather making this an imperative book on best practices Current strategies are mainly through the development of resistant cultivars as the use of chemicals is cost prohibitive to many of those producing millet in developing countries where it is of most value as a food source This book explores non chemical focused options for improving plant resistance and protecting crop yield This single volume reference will be important for researchers teachers and students in the disciplines of Agricultural Entomology Plant protection Resistance Plant Breeding and Biotechnological pest management Establishes basic concepts of host resistance providing foundational insight Synthesizes past biotic stress resistance research with the latest findings to orient research for future strategies for plant protection Focuses exclusively on host plant resistance on all major diseases and pests of millets Presents data and strategies that are globally applicable as millets gain importance as a health food

Abiotic and Biotic Stress in Plants Arun Shanker,Chitra Shanker,2016-02-17 The impact of global climate change on crop production has emerged as a major research priority during the past decade Understanding abiotic stress factors such as temperature and drought tolerance and biotic stress tolerance traits such as insect pest and pathogen resistance in combination with high yield in plants is of paramount importance to counter climate change related adverse effects on the productivity of crops In this multi authored book we present synthesis of information for developing strategies to combat plant stress Our effort here is to present a judicious mixture of basic as well as applied research outlooks so as to interest workers in all areas of plant science We trust that the information covered in this book would bridge the much researched area of stress in plants with the much needed information for evolving climate ready crop cultivars to ensure food security in the future

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