XIV POTENTIAL CROPS

242 88 - 14/1

Potential crops
Review, tropics, subtropics, marginal lands, potential crops
SPORE
Do miracle plants exist?.
SPORE, No. 16, 1988, pp. 1-3

A few years ago, jojoba was being promoted by Third World activists and environmentalists as a miracle plant. Considered by some as a "way to stop desertification" or as "liquid gold", it was also supposed to save whales from extinction. Such a reputation naturally attracted media attention, which made it front page news. Planting jojoba in the Sahel thus became good not only for the Sahel but for the world at large. Some groups or NGOs even went so far as to adopt it as their main goal.
Such enthusiasm was not without foundation as Simmondsia chinensis or jojoba without doupt has many advantages. This bushy species actually does grow well in very dry areas such as the deserts of Mexico or Arizona, its native region. An annual rainfall of 100-500 mm is all it needs to grow. It is resistant to both heat waves and temperatures approaching freezing and demands little in the way of soil fertility as long as it has good drainage.
When it is about 5 years old and 3 meters high, this undemanding shrub begins to produce pods containing oily seeds. These can be used to produce an oil that is, above all, an excellent lubricant because it keeps its viscosity even at high temperatures. As with the whale oil that is normally used, it performs extremely well in gear boxes and transmissions. There are also other uses in the pharmaceutical, cosmetic and even food industries. Jojoba oil also has the advantage of keeping a long time without going rancid.
On the basis of such promising information, many people believed that one only needed to plant jojoba to regenerate the Sahel and thereby increase the incomes of poor farmers and reduce the debts of their countries. Unfortunately, there is often a big difference between what is supposed to happen and what actually happens!
To date, not a single jojoba bush has borne fruit in West Africa. It has now been realized that the climate in the Sahel is hardly appropriate for this plant. Trials that were done in Senegal, and repeated in Australia, confirmed that to blossom and produce fruit the jojoba needs winters that are both cool and humid!
Furthermore, it responds better to alternating periods of short and long days, preferably with large temperature differences. In other words, there are major problems with growing this plant in the Sahel.
On the other hand, it would be unfortunate to abandon jojoba completely. But more detailed studies are needed to determine what can reasonably be expected from growing this crop in Africa. First of all, selection trials are necessary to find productive varieties best adapted to the climates of each region. Attention must also be given to cost-effective production systems that are easy

for farmers to develop. For the moment, it is primarily the USA and Israel that are working with experimental plantations but they are limited by high labor costs, particularly of harvesting. Only Latin America currently seems to have all the conditions needed to make jojoba worth growing.
Jojoba has thus become the perfect example of one of those plants that economic or political factors have pushed to the forefront as a "miracle" species before any long-term tests have been done.
The bushy guayule plant, which is native to Latin America, contains latex in its cells rather than in lactiferous channels as is the case with rubber trees. The proportion of rubber compared to the dry weight of the plant ranges from 10% in wild plants to as high as 25-35% in cultivated plants. To extract it, the plant must be uprooted as it cannot be tapped. As with jojoba, guayule also grows in arid zones. It can survive with 250 mm of rain per year but it grows better with 450 mm.
Generally speaking, these American species have not lived up to expectations in crossing the Atlantic. Adapting plants to new climates is no easy task and certainly cannot be done as rapidly as one often thinks. While the future potential of so-called miracle plants deserve attention, they should not be considered a overnight solution to already pressing problems.
Physic nut (Jatropha curcas L.), which grows throughout the tropics, has recently emerged from the shadows. This hardy tree stands up well to droughts and poor soils. It is traditionally grown in hedges (because animals avoid it), cut for fuelwood or used for its many medicinal qualities well known to local people.
This multipurpose tree has thus many advantages for farmers. Those in Cape Verde were among the first to recognize its value and to start growing it. On plots abandoned for growing annual crops, more than 100 000 physic nut seedlings are being planted. They act as wind breaks, help prevent soil erosion and increase the water retention capacity of the soil. Periodic trimming also generates a supply of fuelwood. But it is the projected production of soap and fuel that promoted people to invest in this crop.
By exploiting it in this way, physic nut can become an inexpensive and easily integrated tool for local development, particularly for promoting small industry. To optimize its potential, research remains to be done on selecting more productive varieties, developing better cultivation techniques and experimenting with simple yet efficient processing systems.
Gum acacia, familiar to people in the Sahel, is also benefiting from a revived and long overdue attention. Growing throughout the Sudan-Saharan region, this multipurpose tree joined the ranks of others that, weakened by droughts and overcutting, slowly disappeared from the landscape. About 4-6 m tall, this thorny tree is specially known for its golden pink excretions, the famous Arabic gum. But it is also a source of forage favored by livestock and of hard wood which makes excellent charcoal. Finally, it helps to retain soil moisture thanks to it well-developed root system and, as with all leguminous plants, it fixes atmospheric nitrogen and thereby increases soil fertility. To respond to this situation, numerous projects have recently been started. The regeneration of

old gum plantations has already begun in Senegal, Mauritania, Mali and Niger.
By returning the gum acacia to its former glory, one would also reduce the stress on the Sahelian ecosystem and favorize a cash crop that has little competition on the international market.
Other plants that have long been part of the African landscape and its local economies can, if favorized, play a significant role in the development of such areas. The often forgotten sheabutter tree is one example. The list of trees and other plants that are poorly known by researchers and development workers is very long: the neem tree with its insecticidal powers; Acacia albida which helps to regenerate soils; kenaf which can be used for paper production; and the many other trees that provide highly appreciated food products. The list of potential uses is also very long.
From domestic facilities up to export products, the diverse potential of these numerous local plants merits much more attention.

243

88 - 14/2

Potential crops
Fruit species, France, Mediterranean region, technical information, markets
ZUANG, H. et al.
Nouvelles espéces fruitières (New fruit species).
Centre Technique Interprofessionel des Fruits et Légumes (CTIFL), 1988, 150 pp.; available from: GEYSER, Vacquières, F-34270 St. Mathieu de Tréviers, France

The interesting species are for example: bastard oleaster, sapote or pistachio tree. All are species now cultivable in France, but some of them only in the Mediterranean region.
This - in its way, unique - publication has been produced by CTIFL for professionals and non-professionals in search of fruit crop diversification, of new tastes or even of new markets, with precise technical information on about 30 species. A list of fruit breeders is also available.
For those interested in learning more about these new introduced species, it is advisable to make a trip to the Island of Porquerolles (botanical conservatorium), where GEYSER cultivates all species in plots for conservation.
Abstract from Agricultures actualité (GEYSER)

244

88 - 14/3

Potential crops
Review, book, developing countries, potential crops, economics
US NATIONAL RESEARCH COUNCIL
Underexploited tropical plants with promosing economic value.
National Academy of Sciences, Washington, D.C. 1979, 187 pp., Catalogue No. 78-71595; available from: National Academy of Sciences, National Research Council, 2101 Constitution Avenue, JH 215, Washington, D.C. 20418, USA

Throughout history, man has used some 3000 plant species for food; at least 150 of them have been commercially cultivated to some extent. But over the centuries the tendency has been concentrated on fewer and fewer. Today, most of the people in the world are fed by about 20 crops, cereals such as wheat, rice, maize, millet and sorghum; root crops such as potato, sweet potato, and cassava; legumes such as peas, beans, peanuts (groundnuts) and soybeans; and sugar cane, sugar beet, coconuts, and bananas. These plants are the main bastion between mankind and starvation. It is a very small bastion.
Yet as the prospect of food shortage becomes more acute, people must depend increasingly on plants rather than animals for the protein in their diet. As is well recognized, research is urgently needed to increase the yield of these food plants. However, reliance on a small number of plants carries great risk, for monocultures are extremely vulnerable to catastrophic failure brought about by disease or variations in climate. To help feed, clothe and house a rapidly increasing world population, it is timely to consider neglected or little-known plant species.
The potential of many tropical crops has never been explored. A striking case is quinua, one of the most productive sources of plant protein. It grows high in the Andes, where few other crops can survive. The Spanish introduced wheat and barley and focused agricultural research only on those crops, which eventually displaced quinua. Despite its intrinsic nutritive and economic value and the fact that protein deficiency is a serious problem in its native region, the agronomy of quinua has advanced little in the past four centuries.
A massive effort is needed to ensure the survival of endangered plant species throughout the world. It comes as a surprise to most non-botanists to learn that one out of every 10 plants is either extinct or in imminent danger of extinction. Over 20 000 species are now in need of protection. Wanton destruction of natural vegetation is killing many, but the spread of conventional agriculture displaces and destroys many others. Careful preservation and cataloguing are particularly important for little-known plants such as those described in this report. Only in this way will the genetic diversity and healthy stock needed for developing new food crops be assured. Potential breeding stocks, clones and cultivars will otherwise become extinct.
This is a report on plants that show promise for improving the quality of life in tropical areas. Because the countries in this zone contain most of the world's low-income populations, this report is addressed to those government administrators, technical assistance personnel and researchers in agriculture, nutrition and related disciplines who are concerned with helping developing countries achieve a more efficient and balanced exploitation of their biological resources.
The ad hoc panel on underexploited tropical plants has the following objectives:
- to identify neglected but seemingly useful tropical plants, both wild and domesticated, that have economic potential;
- to select the plants that showed the most promise for wider exploitation throughout the tropics; and

- to indicate requirements and avenues for research to ensure that selected plants reach their fullest potential.

The 36 plants described here were selected from among 400 nominated by plant scientists around the world in response to a written inquiry. To keep the project on a manageable size, medicinal plants and timber species were excluded.
The panel recognizes that some plants recommended but finally not selected for inclusion in this report may well have similar potential for exploitation. In such cases, the panel did not have, and could not obtain, enough information to support an affirmative decision.
The plants represented here should be seen as complements to, not as substitutes for, conventional tropical crops.
Addresses of knowledgeable contacts are provided so that readers may ascertain for themselves specific details that cannot be covered in a general report of this kind, but that may be critical to the successful introduction of a plant to their locality.

245 88 - 14/4

Potential crops
Review, book, tropics, cassava, food, feed, industrial uses, nutritional value, production technology, integrated pest management, post-harvest technology, national programs
COCK, J.H.
Cassava: new potential for a neglected crop.
Westview Press, 5500 Central Avenue, Boulder, Colorado 80301, USA, 1985, 192 pp., ISBN 0-86531-356-3

Among tropical crops, cassava, rice, sugarcane and maize are the most important suppliers of calories. Until recently, however, decision makers concerned with agriculture in developing countries overlooked cassava. Owing to widely held misconceptions about the crop, only small amounts of funds have been allocated to cassava research and development. This book attempts to demonstrate how cassava, through sustained research and improved production methods, can contribute to improving the diet and livelihood of millions of people. Cassava is grown mainly by small farmers with labor-intensive methods. Although consumption is highest in rural areas, cassava should by no means be regarded as purely a subsistence crop. In the lowland tropics, cassava, particularly in dried forms, is often the cheapest source of calories, and new growing methods promise to reduce the cost even further.
Although the merits of cassava are becoming recognized, it is often feared that expanding cassava production will degrade soil fertility, particularly on marginal soils. Cassava depletes soils no more than other crops. It does, however, have the ability to grow on already depleted soils, which is one if its great advantages. This characteristic, combined with its high production potential, points to the bright prospect that cassava offers as a basic energy source from marginal land in the tropics.

Chapter 1 describes the crop and quantifies its importance.
Chapter 2 sets forth the uses of cassava and the various methods of processing the crop after harvest. Chapters 3 and 4 are devoted to present production practices and the components of technology that can be used to increase productivity. Chapter 5 summarizes recent developments in post-harvest handling. Chapter 6 analyzes several cases in which cassava production has been increased and sets out a framework for the successful implementation of cassava development projects. Chapter 7 describes the critical features of national cassava programs with special reference to research and government policy issues.
In this book, the latest information is brought together on improved strains, modern production systems, better processing methods, innovation in storage and marketing and the prospects for using cassava to produce fuel alcohol. It also explores the cassava production programs of several developing countries and offers suggestions for creating an effective national cassava program.
The book will be useful to policymakers and researchers and is highly recommended for all those working in rural development.

246 88 - 14/5

Potential crops
France, review, manual, medicinal plants, aromatic plants
CHAMARIC, J. et al.
Manuel du producteur de plantes medicinales et aromatique des Pyrénées. Tome 1: Bases techniques. Tome 2: Approche technico-economique - document de synthese (Manual for producers of medicinal and aromatic plants in the Pyrenees. Vol. 1: Technical bases. Vol. 2: Technical economical approach - document of synthesis).
Coopérative L'Herbier des Pyrénées, 1986, Tome 1, 162 pp.; Tome 2, 172 pp.; available from: Coopérative, Laderonne, F-11260 Esperanza, France

This manual enables the reader to approach in a practical way the ecological aspects, harvesting and processing of medicinal plants. Its presentation is most attractive and the publication gives an answer to any question arising to the producer.
The second volume consists of technical economical papers for the wild and cultivated plants, as well as for calculation of equipment costs.
A well done work which is also useful for other regions.
Abstract from Alternatives agricoles (GEYSER)

247

88 - 14/6

Potential crops
Review, book, developing countries, tropics, potential crops amaranth, prospects
US NATIONAL RESEARCH COUNCIL
Amaranth: modern prospects for an ancient crop.
National Academy Press, Washington, D.C., 1984, 77 pp., available from: National Research Council, 2101 Constitution Avenue, JH 215, Washington, D.C. 20418, USA

In pre-Columbian times, grain amaranth was one of the basic foods of the New World, nearly as important as corn and beans. Thousands of hectares of Aztec, Inca and other farmland were planted to the tall, leafy, reddish plants. Some 20 000 tons of amaranth grain were sent from 17 provinces to Technochtitlan (present-day Mexico City) in annual tribute to the Aztec emperor Montezuma.
The use of amaranth in rituals and human sacrifice shocked the Spanish conquistadors, and with the collapse of Indian cultures following the conquest, amaranth fell into disuse. In the Americas it survived only in small pockets of cultivation in scattered mountain areas of Mexico and the Andes. Corn and beans became two of the leading crops that feed the world, while grain amaranth faded into obscurity and today is largely forgotten. The amaranth is a promising unconventional crop to investigate. It is highly nutritious as food. Amaranth, is grown either as a grain crop or as a leafy vegetable. Despite its obscurity, it offers important promise for feeding many people.
In the National Academy of Science study of Underexploited Tropical Plants with Promising Economic Value, amaranth was selected from among 36 of the world's most promising crops. Since then, extensive research has been done on the plant, and this book provides a more detailed examination of its characteristics and prospects.
The panel that produced this report met at the Rodale Research Center of Rodale Press in Pennsylvania. There, panel members examined a field of grain amaranth ready for harvest as well as test plots of several hundred amaranth varieties.
This report, resulting from the panel's deliberations, is intended for agencies engaged in development assistance and food relief, officials and institutions concerned with agriculture in developing countries, and scientific communities with relevant interests.

248

88 - 14/7

Potential crops
Review, book, humid tropics, tree crops, field crops, production, agronomy, potentials, limitations
WILLIAMS, C.N. et al.
Tree and field crops of the wetter regions of the tropics.
Intermediate Tropical Agricultural Series, 1987, 253 pp., ISBN 0-582-60319-6; Longman Group Ltd., Longman House, Burnt Mill, Harlow, Essex CM 20 2JE, England

This book is about the tree and field crops of the humid tropics, where rainfall is generally in excess of evaporation and where the natural vegetation is rainforest of one sort or another.
The most economically important crops in the humid tropics are perennial and essentially nondeciduous; many are trees. Most of the humid tropics are located near the equator (between 10°N and 10°S latitude), a region characterized by an absence of cyclones. In the tropics in higher latitudes and in subtropical regions, crops are often destroyed by cyclones.
This book is primarily intended for students of tropical agricultural science in the higher secondary school and diploma levels but should also be useful to farmers, businessmen and administrators. In writing it, the authors have assumed an elementary knowledge of agriculture, biology and allied sciences on the part of the reader, since the wide scope of the book makes it difficult to cover the whole of the background information. A glossary is provided to help with technical terms. However, a detailed treatment of the principles of crop prduction in the humid tropics is given in Part I, which covers 7 chapters. Part II deals in detail with the individual crops, grouped together in chapters according to the nature of their products. In each chapter, major crops are treated first and in greater detail, followed by minor crops, both groups being given in alphabetical order. This arrangement of the crops seems more logical for a book dealing with the agronomy of tropical crops, rather than purely with their botany, although the important botanical features of the crops are generally described. The book does not attempt to deal with all the numerous agricultural systems encountered in the tropics. Rather, it advocates intensive systems.
For example, cut-and-burn shifting cultivation has a poor effect on fertility, species richness and desertification. Intensive systems of agriculture aim to maintain stable permanent farms. They yield several times as much crop per unit area as extensive systems and allow multiple cropping in the tropics.
Books in the "Intermediate Tropical Agriculture Series" cover a wide range of agricultural and related subjects and are intended to be relevant in all parts of the tropical world.

249

88 - 14/8

Potential crops
Review, book, tropics, pastures, crops, potentials, limitations
HUMPHREYS, L.R.
Tropical pastures and fodder crops.
Intermediate Tropical Agricultural Series, 1987, 153 pp., ISBN 0-582-77523-X; Longman Group Ltd., Longman House, Burnt Mill, Harlow, Essex, CM 20 LJE, England

About half of the world's grazing animals are in the tropics, but the output of animal products from these lands is very much less than from the rest of the world. As this book shows, great scientific progress has been made in understanding the limitations to

production from animals on pasture in the tropics, and in understanding how these limitations may be overcome.
Discussions of grassland improvement in this book will apply to lands beyond the 18°C coolest month isotherm, e.g. to southern Brazil, Paraguay and Uruguay, southern USA, and to southern Queensland and northern New South Wales, since many tropical pasture species grow throughout this wide range of latitude.
The book outlines methods of pasture improvement and examines various improved grass and legume species. It describes the establishment and continued management of pastures and provides information about the animals which graze them.
This second edition contains up-to-date information and a wider range of photographic illustrations. The book is designed for students in diploma and certificate courses at intermediate-level colleges, first-year students at universities and extension workers.

250 88 - 14/9

Potential crops
Review, book, tropics, dry regions, crops
GIBBON, D. and PAIN, A.
Crops of the drier regions of the tropics.
Intermediate Tropical Agricultural Series, 1985, 147p., ISBN 0-582-775066-X; Longman Group Ltd., Longman House, Burnt Mill, Harlow, Essex, U.K.

This book is concerned with the production of economically important crops and trees that are grown in the drier regions of the tropics.
Over 530 million people live in the dry tropics on a land area of over 20 million km^2.
In these areas there is both an annual and seasonal shortage of moisture supply which prevents plants and trees reaching their full potential and they frequently grow under conditions of moisture stress.
The type of crops and trees grown in the dry tropical areas exhibit either varying degrees of resistance to drought conditions or an ability to avoid drought through specially adapted reproductive or storage systems. The range of species that have these characteristics is limited and this reduces the range of opportunities available to farmers and cultivators for developing diverse and stable systems of production.
The first half of the book deals in some detail with some basic principles of the environment and the interaction between crop and environment in the dry tropics, as well as outlining the characteristics of existing farming systems in these areas. It is important to consider these alongside the specific information on individual crops given in Part 2 of the book. The individual crops are grouped in chapters according to the nature of their products, each group being placed in alphabetical order using their English names.

Much of the information presented is based on personal experience in a limited number of the tropical areas and it is accepted that there may be omissions and errors in references to specific areas. However, it is hoped that readers will be bear in mind the overall emphasis on principles and interactions within systems, particularly when considering future alternatives in their own region. This subject is discussed briefly in the final part of the book.
The book is primarily intended for use by students of tropical agricultural science at higher secondary school and diploma levels, but should also be of interest to agriculturalists, planners and others involved in the development of rural areas in the dry tropics.