Bioresources based Industry in Punjab

A Treatise

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Punjab Biodiversity Board
&
Punjab State Council for Science & Technology

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Prepared by

Punjab Biodiversity Board

&

Punjab State Council for Science & Technology

Sponsored by

National Biodiversity Authority, Govt. of India

Prepared by
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Citation
Jerath, Neelima; Singh, Gurharminder & Sehgal, Dhiraj; 2012. Bioresources based Industry in Punjab: A Treatise. Punjab Biodiversity Board & Punjab State Council for Science & Technology, Chandigarh. P : 157

ISBN No: 978-81-88362-27-1

Foreword

Biodiversity is critical to our survival and economic prosperity. The immense value of biological resources, however, remains largely unrecognized as these are frequently taken for granted and treated as 'free goods'. According to UNDP, forty percent of the global economy is based on biological products and processes. Further, as per WHO eighty percent of population in developing countries relies on plant based products for their primary health care needs. However, the ongoing decline of biological resources over the past few decades has decreased the capacity of ecosystems to provide goods and services, and has had profound negative impacts on opportunities for sustainable development. These impacts are particularly prominent in the developing world due to their consumption patterns, health needs and industrial requirements.

It is, therefore, important that the value of these resources is assessed, both in economic & ecological terms. Since, many of these biological resources provide useful raw material for industry, an assessment of their existing demand and supply is a prerequisite to formulate an action plan to devise strategies for their conservation, management and sustainable utilization.

I am pleased that the Punjab Biodiversity Board and the Punjab State Council for Science & Technology, with the assistance of National Biodiversity Authority, have undertaken this pioneering and unique study to assess the commercial utilization and market potential of biological resources used by industry in the state with a focus on important biological resources found in the wild.

I am confident that this publication will help as an enabling tool in identifying species requiring conservation and ensuring their continued availability to the industrial sector in the state. I also hope that the study will help Punjab Biodiversity Board to regulate the collection of certain important plants from Punjab to ensure their sustainable utilization under the ambit of the Biological Diversity Act, 2002.

S. Parkash Singh Badal
Chief Minister, Punjab
& Chairman
Punjab Biodiversity Board

Preface

Biological resources are vital to the very foundation of sustainable development of a region. India accounts for 7.8% of the recorded species of the world and is one of the 17 megadiverse countries in terms of biodiversity. Sustainable use of our biodiversity has both ecological and economic value as it is linked to local livelihoods of millions of people and also has the potential of becoming the core strength of Indian economy.

Punjab's large agricultural base gives it a competitive advantage in various industries such as food processing, textiles, paper, leather, and other agrobased industries, which are rapidly moving up in production and contributing to the state's economy. Realizing the crucial role of biological resources in industrial production and socio-economic development in the state, a study was undertaken on "Inventorizing Industries involved in utilization of bioresources in Punjab" jointly by Punjab Biodiversity Board and Punjab State Council for Science & Technology. The study was sponsored by National Biodiversity Authority. The present publication is an outcome of this study, where an attempt has been made to identify and assess volumes of major bioresources used in Punjab and their commercial potential. Special focus has been accorded to collect primary data on commercial utilization of those species (including medicinal plants) which are generally available in the wild and their trade is restricted to certain parts of the state (like Majith Mandi, Amritsar). The study attempts to assess their economic potential in order to promote their conservation and sustainable use. For this, extensive field visits were carried out in all districts to collect first hand information on use of biological resources by registered herbal units/pharmacies of the state.

The data has been thoroughly categorized, critically analyzed and interpreted to draw logical conclusions. However, given the constraints in data collection/generation, the authors do not claim that the information provided in this book is complete or all exclusive, as only 67% of the registered units responded to the questionnaire and a smaller percentage provided information on all its aspects. Further, this data needs to be supplemented with information on unregistered units, cottage & tiny units and use of botanicals by local hakims and vaids as well. It is also felt that this study needs to be further supplemented with information from traders on specific sites of collection of raw material, especially species which are either threatened or used in large quantities.

However, it is hoped that the present publication will be of relevance to all the stakeholders, both, at Government and community level, and help in defining operational strategies for conservation & sustainable utilization of bioresources to implement the Biological Diversity Act, 2002, in the state.

Authors

Acknowledgments

We wish to place on record our sincere thanks to the National Biodiversity Authority (NBA) for providing financial support to undertake the study especially Dr. Balakrishna Pisupati, Chairman; Dr. P.L Gautam, former Chairman and Shri. C.A. Reddy, Secretary, for their sustained support & guidance.

We are indebted to Shri. Viswajeet Khanna, IAS, former Principal Secretary, Deptt. of Science,Technology & Enviroment, Govt. of Punjab and Shri H.S Kandhola, PCS, former Additional Secretary, Deptt. of Science, Technology & Enviroment, Govt. of Punjab for their support. We are also thankful to all senior officers of Department of Industries & Commerce, Govt. of Punjab; District Industry Centres; Deptt. of Forest and Wildlife Preservation, Govt of Punjab; Punjab Medicinal Plants Board, Punjab Khadi and Village Industry Board and Herbal units for extending unstinted support and help in providing data and requisite information. We would also like to acknowledge the contribution of Mr. Vivek Chandel, Project Associate for collecting initial data and providing critical inputs in data analysis.

The authors express their deep gratitude for the guidance and technical inputs provided by Dr. M. Sharma, Retd. Dean & Head, Deptt. of Botany, Punjabi University, Patiala during report compilation. The contributions of Dr. Daljit Singh, Associate Professor, Deptt of Botany, Govt. College, Hoshiarpur; Dr. Sudhir K. Mahotra, Director, Institute of Ecology & Environment, Pathankot and Dr. G.S Chatha, Associate Professor, Deptt of Botany, Govt. Shivalik College, Ropar are also gratefully acknowledged. We also thank Mr. Baldev Pahwa, Mr. Balram Sharma and Ms. Parveen Lata for typing work.

Last, but not the least, the authors thank all the officers and staff of Department of Science, Technology & Environment, Govt. of Punjab and Punjab State Council for Science & Technology for help provided in compiling this publication.

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Abbreviations

BDA	Biological Diversity Act, 2002
BMC	Biodiversity Management Committee
CBD	Convention on Biological Diversity
CVI	Cottage and Village Industry
Deptt.	Department
G8	Group of Eight
GoI	Govt. of India
GoP	Govt. of Punjab
Govt.	Government
SGDP	State Gross Domestic Product
h	Hour
ha	Hectare
HYVs	High Yielding Varieties
IAS	Indian Administrative Service
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IUCN	International Union of Conservation of Nature
Kg.	Kilogram
KVIB	Khadi & Village Industry Board
LMU	Large & Medium Unit
m	Million
MT	Metric Ton
NBA	National Biodiversity Authority
No.	Number
NTFP	Non-Tiber Forest Products
PBB	Punjab Biodiversity Board
PCS	Punjab Civil Services
PSCST	Punjab State Council for Science & Technology
SHG	Self Help Group
SSU	Small Scale Unit
TEEB	The Economics of Ecosystems and Biodiversity
th. kg	Thousand kilogram
UNDP	United Nations Development Programme
USD	United State`s Dollor
w.r.t	With respect to
WHO	World Health Organization

Executive Summary

The variety of genes, species and ecosystems which encompass populations, communities & habitats constitute biological diversity. It forms the foundation upon which human civilization depends and is essential for maintaining the basic life processes and for performing environmental services. Population pressure, industrialization, intensive agricultural and extensive use of natural resources are, however, leading to loss of biological resources.

India accounts for 7.8% of the global recorded species and is one of the 17 mega diverse countries of the world. Four biodiversity hot spots of world (out of 35) exist in India. The country is estimated to house about 45,000 plant species and 89,442 animal species representing 12.5% of the world's flora and 6.6% of fauna. The Biological Diversity Act, 2002 has been enacted by the Govt. of India to promote conservation and sustainable of biological resources.

Punjab is primarily an agricultural state with about 84% land area under agriculture. The state harboured considerable genetic variability in the past, both, in wild and cultivated areas. However, this has reduced over the years due to changes in cropping pattern, extensive & intensive farming and higher dependence on HYVs. Though the state has only 6% area under forests, yet a large variety of flora & fauna has been recorded from Shivaliks and wetlands. Data indicates the presence of 397 species of algae, >560 species of fungi, 21 species of lichens, 34 species of bryophytes, 21 species of gymnosperms and 1939 species of angiosperms in the state. Faunal diversity includes 112 species of fishes, 15 species of amphibians, 35 species of reptiles, 442 species of birds and 43 species of mammals, besides, large number of invertebrates. Prior to the green revolution, 41 varieties of wheat, 37 varieties of rice, 4 varieties of maize, 3 varieties of bajra, 16 varieties of sugarcane, 19 species/varieties of pulses, 9 species/varieties of oil seeds and 10 varieties of cotton were reported to be in use in Punjab. Data indicates that out of 49 post green revolution varieties of wheat released by PAU, only 3 are widely used. Similarly, out of 27 varieties of rice released, only 9 are currently in use.

The state has done remarkably well in the field of agriculture and is now laying emphasis on promoting industrial growth. Presently, there are 162,559 small scale and 373 large and medium scale industries. The Industrial production has more than doubled in both, small scale industries (from Rs.183.24 billion in 2001 to Rs. 418.96 billion in 2010) as well as medium/large scale industries (from Rs. 265.76 billion in 2001 to Rs 583.12 billion in 2010). Various industrial sectors like processed food, rice, yarn & textile, hosiery, pulp & paper and sports goods depend upon biological resources which are being cultivated and are normally traded. The share of industrial sector (Secondary Sector) to State Gross Domestic Product has increased from 20% in 1980-81 to 29% in 2009-10. There are also 255 registered herbal units operating in the State, besides many unregistered units. These are extensively utilizing medicinal plants and herbs which are obtained from various parts of Punjab and adjoining states.

No systematic study has been carried out in the State to assess the utilization and marketing of biological resources, which are generally not normally traded and are exempted from provisions of the Biological Diversity Act, 2002 provided they are traded as commodities, as notified by Govt. of India under section 40 of the Biological Diversity Act, 2002 (commonly referred to as 'normally traded commodity' list). The present study gives a brief overview of various bioresources based industries in the state with special focus on industries using medicinal and aromatic plants, which are not included in the above notification, to assess their economic potential so as to promote their conservation and sustainable use. Extensive field visits were made to collect primary as well as secondary data.

Bioresources based industry in Punjab

Punjab's large agricultural base gives it a competitive advantage in various agrobased industries like food processing, textiles, paper, leather, etc. Further, bioresources (including medicinal and aromatic plants) are also being used as raw material by some pharmaceutical & nutraceutical industry in the state. Most of the raw material being used by these industries is either being cultivated or is covered under the above referred notification of the Ministry of Environment and Forests, Govt. of India. The Ministry had exempted 190 biological resources including 35 medicinal plants, 28 spices and 127 other crops from the purview of the Biological Diversity Act, 2002. Prior permission of the National Biodiversity Authority would not be required for export of these 190 items. However, certain raw materials used by the industry are obtained from the wild and are covered under the provisions of the Biological Diversity Act, 2002.

Data indicates that out of the total 373 large/medium units (LMU) in the state, 310 units (83%) are utilizing bio-resources as major raw material. These include 142 units of food products & beverages (45%), 96 textile units of both, natural & synthetic fibre (31%) and 33 paper & paper products units (11%). The maximum bioresources based LMUs are located in district Ludhiana (77) followed by districts Patiala (59), and Mohali & Amritsar (32 each). Data also indicates that 13% (20,940) of the total Small Scale Units (SSU) are bioresource based enterprises. These include food products & beverages (6081), leather & leather products (4263), textiles (1425 approx.), wood products (2783), furniture (2621), paper & paper products (754), rubber products (647), hosiery & garments 394), pharmaceuticals & botanicals (212) and tobacco products (7). Ludhiana (4292), Amritsar (2816), Sangrur (2803) and Jalandhar (1926) are leading districts for bioresources based SSUs in the state.

Punjab's food and beverage industrial sector covers grain processing, alcoholic beverages, fruit and vegetable processing, meat and poultry, milk & milk products, sugar & edible oil, soya based products, etc. There are total 6223 food and beverage industries in state consisting 142 LMUs and 6081 SSUs, and maximum units are situated in District Sangur (841), Ludhiana (627) & Amritsar (615). Eighty one per cent units are manufacturing grain/cereal based food products & animal feed. The textile sector contributes about 19% to the total industrial production and about 38% to the total exports from Punjab. The sector is also one of the largest employment provider and accounts for almost 60% of industrial employment in the state including the largest employment providing sector to women. The textile sector is strong on all aspects of the value chain, i.e., from the raw material stage to the finished products stage. Natural fibers are being used by 45% of LMU/SSU units, whereas 55% units are using artificial fibers, which are cheaper as compared to natural fibers. Out of a total of 3264 textile units (3168 SSU and 96 LMU) in the state, over 1460 units are bioresource base. More than two third of textile units (76%) are manufacturing knitted and crocheted fabric & articles and remaining 24% are involved in spinning, weaving and finishing. Ludhiana is one of the important centres of hosiery industry of India for cotton, woollen and synthetic knitwear. Ludhiana hosiery industry caters to about 90% of the total demand of woollens besides, being leading exporter to USA, Europe and Middle East.

The leather industry in Punjab is facing a shortage of quality hides even though cattle head count of the state stands only second to Uttar Pradesh in the country. Presently, more than 40% of the raw material is being purchased from outside the state. Leather products worth Rs.2.17 billion and Rs. 2.34 billion have been exported mostly to European countries from the state in the years 2009 and 2010, respectively. There are 4268 leather goods industries operational in the state comprising 5 LMUs and 4263 SSUs. Data indicates that 653 rubber manufacturing units are operational in the state consisting of 647 SSUs and only 6 LMUs(in Ludhiana). The natural rubber accounts for 33% of the

total bioresource base of the industry. There is an acute shortage of natural rubber in Kerala owing to ever growing demand leading to upswing in its prices. The unprecedented hike in natural rubber prices in last few years coupled with fall in demand of some rubber-based products, has put the rubber industry of Punjab in jeopardy. About 2/3rd of rubber units (74%) are involved in the manufacturing of rubber tyres & tubes, while rest (26%) are manufacturing rubber footwear.

There are 797 paper units in the state, out of which, 33 are LMUs and 764 are SSUs . The paper industry of the state is mainly utilizing waste paper, wood pulp, agri-residues like wheat straw and kana grass (sarkanda), etc. as raw materials for manufacturing paper products. However, the industry is quite concerned about the ever increasing prices and fluctuations in supply of raw materials. Even though the state has a very small area under natural forests (6%) and agroforestry, still, 2783 wood product units and 2621 furniture making units are functional in the state. Eucalyptus and poplar are being used as main raw materials by plywood industry. The furniture units extensively use Dalbergia, Teak, Bamboo, Cane, Deodar, Mango, Neem etc for making different type of furniture articles. However, Dalbergia and Teak are generally preferred for making quality furniture. There are 7 small scale tobacco manufacturing units in the state, mainly producing snuff, katha, chewing lime, etc. Most of the raw material is being brought from other states though *Acacia catechu* is available in the Shivaliks. There are 268 registered units of cottage and village industries in the state with an employment of about 1650 workers. Out of these, 121 units are utilizing various kinds of bioresources as raw material.

Herbal industry in Punjab

Worldwide, between 50,000 and 80,000 plants, mostly flowering, are used medicinally. About 80% population of developing countries relies on plant based products for their pharmaceutical and nutraceutical needs and there is a global resurgence in traditional and alternative health care systems, resulting in world herbal trade of about US$ 120 billion, which is expected to reach US$ 7 trillion by 2050. India has approximately 17,500 species of flowering plants. Out of these, 6000-7000 species are estimated to have medicinal usage in folk and documented systems of medicine like Ayurveda, Siddha, Unani and Homoeopathy. About 960 species of medicinal plants are estimated to be in trade, of which, 178 species have annual consumption levels in excess of 100 metric tonnes. The Indian medicinal plants and their products account for exports of about Rs. 10 billion. There are nearly 9,500 registered herbal industries along with many unregistered cottage-level herbal units in the country, which depend upon the continuous supply of medicinal plants for manufacture of herbal medical formulations based on Indian Systems of Medicine. Broadly nine categories of products are being obtained by industrial processing of medicinal plants. These include new drugs, phytopharmaceuticals, health and immunity enhancing products and nutraceutical, cosmetics, intermediates for drug manufacturing, galenicals, etc. Significant quantities of medicinal plant resources are also being consumed in the country at the household level through traditional healers and practitioners.

About 800 species of medicinal plants are used by industry out of which majorly 20 species (2.5%) are being cultivated. Over 90% of the species are mainly collected from the wild. Further, over 70% of these plant collections involve destructive harvesting practices and pose a definite threat to the diversity of medicinal plants in the country. Marketing of medicinal plants is inefficient, informal, secretive and opportunistic. As a result, the raw material supply situation is shaky, unsustainable and exploitative.

There are 255 registered herbal units operating in Punjab, besides many unregistered herbal units, which are utilizing botanicals to prepare various product formulations (with or without the species

included in the afore mentioned notification of the Ministry of Environment & Forests, Govt. of India). Out of these 180 units were found to be functional, out of which limited data has been provided by 121 units only (67.2%) from 15 districts (out of 20 districts). These 121 units are using 919.9 MT/annum of raw plant materials. However, no data has been provided w.r.t. areas/sites of collection and volumes of certain important species obtained from the wild which are currently being used by the industry. The district wise usage of plant species by pharmacies/herbal units in Punjab ranges from 279 kg/annum in district Mansa to 527 MT/annum in district Amritsar, which is 57% of the total usage in the state. Other districts with high consumption value are Ludhiana (>153.6 th. kg/ annum), Sangrur (>80 th. kg/annum) and Jalandhar (>68 th. kg/annum). These account for 17%, 9% and 7% usage respectively. Rest all districts are using raw material in the range of 3% to 1%. The maximum (28) herbal based industrial units are functioning in district Amritsar followed by 26 units in district Ludhiana, 17 units in district Jalandhar and 14 units in district Sangrur. Data about the harvesting and processing of medicinal plants by hakims, vaids, SHGs and communities is not available.

None of the industries provided any information on direct collection sites. It was informed that raw material was being procured from the market/traders and not collected directly. Such traders operate in Majith Mandi at Amritsar, collection center at Pathankot and in other states as well. Majith Mandi is known as the trade hub of some of these biological resources. Raw materials from Punjab and nearby states is collected here and categorized for export and/or domestic consumption. Fifty four dealers/traders exporters are operating in Majith Mandi. An estimated 22,000 Metric Tonnes of botanical's (mainly 67 species) are being annually traded from Majith Mandi. Many stakeholders with divergent interests are involved in the marketing of medicinal plants in state and organized marketing, standardization and quality control practices are lacking.

Industry wise data indicates that the ten highest herbal raw material consuming units of the state are located in District Amritsar (8), Ludhiana(1) and Fatehgarh Sahib(1) and are collectively utilizing 524,481 kg of raw materal per annum, which is about 57% of total herbal usage in the state. Pharmaloids, Amritsar (131,100 kg), Hoap Industries, Ludhiana (111,170 kg) and Himachal Drug Pharma, Amritsar (58,151) are using maximum botanical raw material. A total of 503 plant species are being used in the state, out of which, 334 species (66%) occur in Punjab and the rest are being brought/collected from other states. Data reveals that of the 334 plant species from Punjab, 127 are herb species, 110 are tree species, 63 are shrubs, and 34 are climbers. Out of total 503 species used, only 82 species are exempted from the provisions of the Biological Diversity Act, 2002 (as these are included in the list of 'normally traded commodities' notified by Govt. of India). Therefore, prior permission of National Biodiversity Authority is required for export of rest of the 421 plant species or their products being traded from the state. The most used medicinal plants are *Aloe barbadensis* (175 Tons/annum), *Emblica officinalis* (38 Tons/annum) and *Terminalia chebula* (25 Tons/annum). Data points that out of the 10 maximum used plant species, six species namely, *Terminalia chebula*, *Commiphora wightii, Tinospora cordifolia*, *Tribulus lanuginosus,Terminalia arjuna* and *Terminalia belerica* do not fall under 'normally traded commodity list', but are very important species used by the industry. Other important species excluded from the normally traded commodities list which are being collected from the state include *Saraca asoca* (11311 kg/annum), *Boerhavia difffusa* (10979 kg/annum), *Sesamum orientale* (10951 kg/annum), *Asparagus racemosus* (7314 kg/annum), *Psoralea corylifolia* (10951 kg/annum), *Mucuna pruriens* (5290 kg/annum), *Eclipta prostata* (5290 kg/annum), etc. Conservation of their habitat and regulated harvesting needs to be promoted to ensure their long term sustainability.

Two plant species, namely *Techomella undulata* and *Withania coagulans*, being used by herbal units have been identified as threatened species in the state. *Techomella undulata* has been identified as an 'endangered species' and *Withania coagulans* as 'vulnerable species' as per IUCN Red Data List. Only 10 kg/annum of *Withania coagulans* is used in the state, but the usage of *Tecomella undulata* is quite high (790 kg/annum). Since these are threatened species of the state, their trade and harvesting needs to be specifically monitored. Further, special focus needs to be given on conservation of the habitat of their two species.

Information about the annual turnover was provided by only 74 units (61%). The total annual turnover of these units collectively amounts to approx. Rs.28 crore (280 million). Only 7 units had a turn over of more than one crore per annum. The turn over of 10 units ranged between Rs.50 lac to Rs.1 crore, 32 units had a turn over ranging between Rs.10 to Rs.50 lac and 25 units showed annual turn over of less than 10 lac. Data on product details reveals that these units produce ayurvedic and unani medicines (tablets, capsules, powders, medicinal oils etc.) nutraceuticals (teas, syrups, tonics and drops), cosmetics (face packs, shampoos, gels, creams, face powders, hair oil, henna & herbal dyes, soaps & toiletries, etc.) and pickles & food supplements (juices, sherbats, etc.). Twenty four units have also provided names of traders from where raw material is being purchased. This includes 22 traders from Punjab and 10 traders from Delhi, Uttarakhand, Haryana and Madhya Pradesh.

Bioresources based un-registered cottage/tiny units

About 500 unregistered tiny and cottage units based on biological resources exist in the state with a large percentage occuring in the Shivalik area alone due to higher availability of non-timber forest produce (NTFP), wild medicinal plants, etc. These units provide livelihood to local communities in about 300 villages in the Shivalik area falling in five forest divisions namely, Ropar, Garhshankar, Hoshiarpur, Dasuya and Pathankot. The local population accesses these bio-resources, both from the forests and uncultivated areas as raw material.

A pilot study was got conducted under the present project to assess the extent of bio-resources used in such units, identify specific areas from where these resources were being collected, extent of involvement of the local communities, list of products and production value. As per the survey, a total of 371 Self Help Groups (SHGs) with about 5000 members were found to exist in 223 villages. These SHGs were engaged in various income generation activities and collectively made an earning of about Rs. 44 lac per annum during the study period. The survey indicates that mainly 22 categories of livelihood activities were being taken up through these non-registered units, out of which at least 10 were based on resources which were not normally traded i.e. rope making, leaf plate making, basket, chatai, broom making units, medicinal plant units, pickle making units based on wild fruits, chyavanprash making units and units involved in trade of wheat straw and vermicomposting.

The way forward

The study needs to be supplemented with information from traders on specific sites of collection of raw biological materials, especially plants which are either threatened or used in large quantities. The extent of plant usage by cottage/tiny industry, both in the organized and unorganized sectors and access by vaids and hakims also needs to be assessed to help define strategies for their conservation and sustainable utilization to implement the Biological Diversity Act, 2002 in the state. Information on associated Traditional Knowledge will also help to strengthen the 'Access and Benefit Sharing' mechanism and help local communities recognize the economic benefits of protecting biodiversity.

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