PROCEEDINGS

Annual Vice Chancellors Convention
of the Indian Agricultural Universities Association
& National Symposium on "Tribal Area Development"
organized & hosted by
Orissa University of Agriculture & Technology, Bhubaneswar
on 7-8 December, 2010

ORISSA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
Bhubaneswar - 751003, Orissa

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LEAD PAPERS

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Summary of Recommendations of the Annual Vice Chancellors Convention of Indian Agricultural Universities Association & National Symposium on "Tribal Area Development" Organized & Hosted by OUAT, Bhubaneswar, Orissa, 7-8 December, 2010

General Recommendations from Vice Chancellors Convention:

1) The tenure of Vice Chancellors of State Agricultural Universities should be minimum of 5 years & age of their superannuation should be 70 years. Similarly age of superannuation of faculty members should be 65 years as per UGC norms.
2) The state Govt. should take primary responsibility of Agril. Education. There should be a separate line of funding in state budget for State Agricultural Universities with revision atleast every 2 years.
3) The State Agricultural Universities (SAUs) should not be bifurcated or fragmented to 2 or more universities, rather new SAUs with necessary funding, infrastructure & manpower be established if essentially required.
4) The Private Agricultural Colleges existing in General Universities should be brought under the State Agricultural Universities under National Agricultural System.
5) The Zonal Research Stations should be strengthened to cater to the need of generating location specific technology.

Specific Recommendation for "Tribal Areas Development"

1) Intensive literacy drive & checking school dropouts in tribal areas to remove superstitions beliefs, liquor addiction & poverty of Tribals.
2) Provision of proper market, with market support policy & access to Information & Communication Technology to tribals to make agricultural products remunerative.
3) Evaluation of all existing welfare schemes on tribal people, identification of reasons for failure or non adoption of technology for refinement and formulation of new schemes / programmes in an integrated manner.
4) Establishment of Central Agricultural University / Specialized National Institutes in the intensive tribal populated zone of the country to address tribal need.
5) Initiation of Network Project / AICRP on Tribal Area Research in tribal populated states for solving state specific tribal problems.

6) Amendment of Forest Conservation (Amendment) Act of 1988, distribution of degraded land amongst tribals & comprehensive acceptable package for displaced persons before undertaking any essential development Project in tribal areas.

7) Improvement of livestock sector through establishment of viable co-operative societies, fodder cultivation, periodic training on livestock management, provision of soft loan for Animal Sector including backyard poultry, piggery, goatery & fishery.

8) Ensuring timely supply of quality planting materials of horticultural crops & seeds of other crops viz., cereals, miner millets, pulses etc. as per the need of tribal area.

9) Integration of primary, secondary & tertiary agricultural activities like kendu based/ sericulture based / bamboo based products, food processing, beekeeping, mushroom culture along with crop & animal husbandry through Integrated Farming System & Cropping System models for holistic economic growth of tribal people while conserving soil, water and the rich bio-diversity of the region.

10) Encouragement of Agricultural processing facility in tribal areas in Public Private Partnership mode for value addition and higher return for Agricultural produce.

11) Need based & problem oriented training through KVKs & training on women empowerment, exposure visit of tribal people of less developed area to the developed tribal area for interaction with successful tribals.

12) Promotion of Self Help Groups (SHGs) / Commodity Groups / Women SHGs etc. to empower the tribals for Agricultural production and marketing of produce in a Co-operative manner for better return through enhanced bargain power.

13) Soil & water conservation measures like rainwater harvesting, check dams, conservation Agriculture etc. for enhancing cropping intensity & year round employment generation.

14) Development of small tools & implements for drudgery reduction and appropriate technology for enhancing farm productivity in tribal areas for easy adoption.

15) Engagement of scheduled tribe agricultural graduates as ambassadors through KVKs to win the trust of the tribal people and motivate them for their holistic development.

Proceedings of the Annual Vice Chancellors Convention of Indian Agricultural Universities Association & National Symposium on "Tribal Area Development" organized & hosted by OUAT, Bhubaneswar, Orissa during 7-8 December, 2010

The Inauguration of the Annual Vice Chancellors Convention & National Symposium on "Tribal Area Development" of Indian Agricultural Universities Association (IAUA) was held on 7 December, 2010 in the Dr. M. S. Swaminathan Hall of Orissa University of Agriculture & Technology (OUAT), Bhubaneswar. His Excellency, the Governor of Orissa & Hon'ble Chancellor of OUAT, Shri Murlidhar Chandrakant Bhandare inaugurated the meeting as the Chief Guest of the function by lighting the lamp along with other dignitaries on the dais in presence of galaxy of Vice-Chancellors' and distinguished delegates from different states. The meeting was attended by the Hon'ble President, Indian Agricultural Universities Association and Vice-Chancellor, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad, Prof. Dr. Rajendra B. Lal; Esteemed Chairperson, World Noni Research Foundation, Ex-Chairman, Agricultural Scientists Recruitment Board, Dr. Kirti Singh and Esteemed Deputy Director General (Education) of Indian Council of Agricultural Research, Dr. Arvind Kumar as the Guests of Honour; Secretary General, Indian Agricultural Universities Association, Dr. R. P. Singh; Hon'ble Vice Chancellor, OUAT, Prof. D. P. Ray; Dean of Research, OUAT & Organizing Secretary, Dr. M. M. Panda; Esteemed Member Vice-Chancellors / Deans & Directors of Agricultural Universities/ Deemed to be Universities of the Indian Agricultural Universities Association and other invitees i.e. Secretaries to Government of Orissa, Directors and other State Government Officers & ICAR institutes located in Orissa. (List of participants is given in Annexure - 1).

The Hon'ble, Vice-Chancellor, OUAT, Prof. D.P. Ray in his welcome address briefly highlighted the importance of the convention and theme of the symposium and described it as timely and relevant.

Dr. R.P. Singh, Secretary General, IAUA, in his introductory speech appreciated the theme of the symposium proposed by OUAT and raised some of the issues for consideration in the convention viz., (i) the minimum tenure of Vice-Chancellor's should be of 5 years and age of superannuation should not be less than 70 years uniformly throughout the country (as per U.G.C. norms), (ii) provision for separate line of funding in state budget for SAUs which is to be revised after every two years, (iii) need to attract the rural students to agricultural education by reserving 60% of the seats or by providing 10% extra weightage in marks during admission, (iv) priority to intermediate (Agriculture) students for admission in B.Sc. (Ag.) and B.Tech. (Ag. Engg.), (v) authorize agricultural graduates for issuing license towards dealership of various agricultural inputs, (vi) need to take care of drop out students and involve them in grass root level information system, (vii) at least two percent of the money collected by Mandi Samitiees to be paid to SAUs for agricultural education, research & extension and (viii) empowerment of women farmers.

Dr. Kirti Singh, Guest of Honour and Chairperson, World Noni Research Foundation & Ex-Chairman, ASRB, New Delhi, stressed upon the need of revolution in the field of agricultural education. He expressed his concern on non-adoption of recommendation of Dean's committee on uniformity in syllabus and grading system in some of the SAUs and deemed to be universities. He also expressed his concern on bifurcation / trifurcation of agricultural universities within the state. He appreciated the performance of some of the private agricultural colleges under General Universities and suggested to bring them under the Agricultual Universities. He also stressed on effective learning and imparting quality education which includes RAWE. He appreciated the role of ICAR as an apex body in monitoring the quality of education and providing support for infrastructure development. He further opined that (i) state Govt. should take primary responsibility of agriculture education through adequate funding, (ii) peer review of the agricultural universities should continue and be completed and (iii) need of implementing the report of MS Swaminathan committee on higher education.

Dr. Arvind Kumar, Guest of Honour, DDG (Education), ICAR, New Delhi briefly highlighted the scenario of agricultural and allied sector of Orissa and pointed out the constraints of productivity and mentioned some of the solutions for improvement. He stressed upon (i) the concept of integrated agricultural university, (ii) strengthening of Zonal Agricultural Research Stations, (iii) increasing the retirement age of faculty members to at least 65 years as per U.G.C. rules, (iv) measures for confidence building in students and faculty members through development of communication skills and (v) the role of Vice-Chancellors of SAUs in bringing the agricultural education to a new height.

Prof. (Dr.) Rajendra B. Lal, President IAUA & Vice-Chancellor, SHIATS, Allahabad in his presidential remarks congratulated Prof. D. P. Ray, Vice-Chancellor, OUAT, for the significant growth of host University and for successful organization of Vice-Chancellor's convention & National Symposium. He expressed his concern in yield gap observed between research farm and farmers field and urged the agricultural universities to bridge this gap by strengthening extension system and support mechanism and encouraging field testing in public-private partnership mode. He was of the view that (i) establishment of new agricultural universities with all facilities should be encouraged instead of bifurcation and (ii) better performing private Agricultural colleges should be brought under the ICAR education system. He urged the delegates to accept the challenges as the prime responsibility of Agricultural University for producing more food not only to feed our own countrymen but also the neighbouring ones.

His Excellency, the Governor of Orissa, Sj. Murlidhar Chandrakant Bhandare, described the topic of the symposium as a national issue and expressed his great concern on enhancing literacy, alleviating poverty, cultivation practices and health aspects of the tribal community. He appreciated the efforts of the host university in successful implementation of "Gyanalok" programme in selected tribal areas of Orissa. He also appreciated the efforts of Koraput tribal farmers in conserving the rice cultivars and rich bio-diversity. He urged the delegates to deliberate and suggest practical measures for development of tribal areas in agriculture and forestry sector to ensure the economic growth of tribal farmers without affecting the bio-diversity of the region and to bring them to the mainstream of development. He wished the convention a grand success.

The inaugural session was ended with a formal vote of thanks offered by Dr. M.M. Panda, Dean of Research, OUAT and Organizing Secretary to all the distinguished participants. Dr. J.M.L. Gulati, Agronomy and Dr. (Mrs.) Kalpana Rayguru, Post Harvest Technology, OUAT were rapporteurs.

Technical Session-I

The Session was held in Biju Pattnaik Hall of OUAT under the Chairmanship of Dr. Arvind Kumar, DDG. (Edn.), ICAR. Prof. C.S. Chakrabarti, Vice Chancellor, West Bengal University of Animal and Fishery Sciences, Kolkata was the Co-Chairman. After brief deliberations, Dr. Kirti Singh, Former Chairman, Agricultural Scientist Recruitment Board acted as Chairman for the session as Dr. Arvind Kumar left for Delhi. Dr. Niranjan Sahu, Medicine and Dr. R.C.Dash, FIDU, OUAT were rapporteurs.

Prof. D.P. Ray, Vice Chancellor, OUAT presented his lead paper on "The problems of the tribal farming", i.e. religious beliefs and practices, shifting cultivation, low farm productivity, repulsion to modern plant protection practices, use of traditional tools and equipment, diversification of land for other uses, land ownership & disputes, marketing problems, effect of climate change, language barrier, addiction to country liquor and inappropriate technology. Dr.M.P.Pandey, Vice Chancellor, IGKVV, Raipur presented the social and cultural systems pertaining to the tribes of Chhatisgarh and expressed concern on the declining number of cultivators and increasing number of labourers among the tribals.

The presentations were followed by the opinions of the panelists namely Prof. A.K.Das, Vice Chancellor, UBKV, Coochbehar, Dr. S.K.Sanyal, Vice Chancellor, BCKV, West Bengal and Dr. V.Prabhakar Rao, Vice Chancellor, SVVU, Tirupati.

Recommendations:

1. Intensive literacy drives to wipe out superstitious or religious beliefs in connection with the agricultural practices from the minds of tribals.
2. Steps against addiction to country liquor preferably through women Self Help Groups (SHG).
3. Improvement in livestock sector through establishment of viable milk co-operative societies, fodder cultivation, provision of soft loans to needy tribal livestock farmers and periodic training progrmmes on modern livestock management practices.
4. Market support policies to make agricultural products of tribal areas remunerative.
5. Amendment of Forest Conservation Act of 1988, distribution of degraded land amongst the tribals and financial assistance for horticulture.
6. Government initiative to maintain & promote distinct identity of indigenous tribal art and culture and checking atrocities on the tribal people.
7. Comprehensive acceptable rehabilitation package for displaced persons before undertaking any essential development project in tribal areas.
8. Engagement of Scheduled Tribe agricultural graduates as ambassadors through KVKs to win the trust of the tribal people and motivate them for their holistic development.
9. Evaluation of the impact of earlier welfare schemes on the tribal people and identification of reasons for rejection of the technology, if any for refinement and formulation of new programmes.
10. Utilization of funds under Integrated Tribal Development Agency (ITDA) to establish KVKs in the tribal area for their overall development.
11. Establishment of a Central University for the tribal areas in Bastar region of Chhattisgarh or any other tribal dominated areas of the country.

Technical Session II

The session was chaired by Dr. G. Kalloo, Vice-Chancellor, JNKVV, Jabalpur and Co-chaired by Dr. R. C. Maheshwari, Vice-Chancellor, SDAU, Sardar Krushi Nagar. The panelists were Sri K. R. Viswambharam, Vice-Chancellor, KAU, Kerala, Prof. S. S. Chahal, Vice-Chancellor, MPUA & T, Udaipur and Dr. B. Mishra, Vice-Chancellor, SKUAS & T, Jammu.Dr. P. K. Rao, ABG and Dr. C. R. Satapathy, Entomology of OUAT were rapporteurs.

During the session Dr. B. N. Singh, Director of Research, BAU, Ranchi presented lead paper on "Integrated farming system for higher income & sustainability in tribal areas of Jharkhand" and Dr. V. M. Mayande, Vice-Chancellor, Dr. PDKV, Akola presented lead paper on creating job opportunity through processing, value addition & marketing system in tribal area.

Recommendations:

1. Ensuring the supply of quality seed of cereals, minor millets, pulses etc. and planting material of horticulture crops, (tuber crops, medicinal plants, flowers etc.) depending on the requirement of tribal areas.
2. Promotion of Animal sector including backyard poultry, piggery, goatary, fisheries etc.
3. Development of appropriate cropping system and farming system models based on the requirement of tribal area.
4. Promotion of secondary agriculture activities, especially processing facilities like Kendu based, sericulture based, bamboo based product, saw dust, particle board, natural dyes, mini Dal mill, chilli extractor, turmeric / fruit processing, bee keeping etc.
5. Proper marketing of the raw produce to ensure economic security.
6. Integration of primary, secondary and tertiary agriculture to ensure economic and employment security of tribal people.

Technical Session III

The 2nd day programme was held at Yatri Niwas of Orissa Tourism Development Corporation, Govt. of Orissa, Konark, Puri on 8th Dec., 2010. The session was chaired by Dr. V.S. Tomar, VC, Rajmata Vijyaraje Scindia Krishi Vishwa Vidyalaya, Gwalior and Co-Chaired by Dr. V.P. Rao, VC, Sri Venkateswara Veterinary University, Tirupati. Dr. C.S.K. Mishra, Zoology and Dr. S. Mahapatra, Agri Business Management of OUAT were the rapporteurs.

Presenting his paper on "Protection of Natural Resources in Tribal Farming", Dr. P.Murrugesa Boopathi, VC, TNAU, Coimbatore was of the opinion that shifting agriculture results in soil erosion, depletion of forest resources and biodiversity loss.

Dr. A. M. Shekh, VC, AAU, Anand added few relevant points viz., (i) women empowerment in tribal areas through need based training, (ii) encouragement of public Private Participation in agricultural processing in the tribal belt, (iii) stress on animal husbandry, marketing facilities, formation of cooperatives for the economic growth of tribal people, (iv) efforts to check malnutrition and school dropout problems in tribal areas and (v) conservation of animal and fish diversity and (vi) certification of organic products.

Recommendations :

1. Development of Agroforestry measures for eco-restoration.
2. Prioritization of soil & water conservation measures under tribal welfare schemes.
3. Access of ICT in tribal pockets.

Technical session – IV

The session was chaired by Mr. K.R. Viswambharan, VC, KAU, Kerala and Co-chaired by Dr. A.R. Pathak, VC, NAU, Navsari. Dr. Sanjaya Kumar Dash, Agril. Processing & Food Engineering and Dr. Santanu Mohanty, Soil Science of OUAT were the rapporteurs. Dr. K. Narayana Gowda, VC, UAS, Bangalore presented lead paper on "Tribal development – A perspective" while Dr. A.R. Pathak, VC, NAU, Navsari and Dr. S.K. Sharma, VC, CSK HPKV, Palampur presented lead papers on "Tribal area development in Gujarat" and "Conservation of Agro-biodiversity (plants/animals/fish) in tribal areas of N-W Himalayas", respectively.

Recommendations:

1. Planned exposure visits, interaction with successful tribals, specialized training for tribal youths and women through separate training institutes
2. Identifying tribals studying in SAUs for special care
3. Involvement of the tribals in planning, execution and evaluation stages of all the developmental programmes and taking care of their traditional social system
4. Creation of job opportunities through value addition and marketing
5. Planned efforts in the area of crop diversification, soil conservation, check dams & establishment of technology dissemination centres in each clusters of tribal hamlets
6. Conservation of potential plant and animal germplasms, *in situ* and *ex situ* in participatory mode & promotion of agro-ecotourism
7. Development of technological package according to the Agro-climatic Zone and specific needs of tribals.

Technical session – V

The session was devoted to a panel discussion on "Problems of tribal area development and solutions: role of Agricultural Universities". Prof.A.K. Das, VC, UBKV, Coch Behar was the Chairman of the session. Dr. B.B. Mishra, Microbiology and Dr. P.K.Roul, Agronomy of OUAT were the rapporteurs. Prof. C.S. Chakraborty, VC, WBUA & FS, Kolkata, Prof. V.S. Tomar, RMVSKVV, Gwaliar, Dr. A.B. Patil, Registrar, UHS, Bagalkot, Karnataka and Dr. K.R. Dhiman, VC, DYSPUHF, Solan, HP put forth their valuable views. The major problems of tribals surfaced were (i) illiteracy, low human development index, (ii) poverty and livelihood insecurity, (iii) lack of title hood of land, (iv) rainfed & subsistence type of agriculture, (v) migratory behaviour in search of non farm labour, (vi) poor infrastructure viz., road, school, etc. and (vii) no specialized research and development institutions of ICAR to address such issues.

Recommendations:

1. Establishment of specialized national institutes and universities to address the tribal needs.
2. Launching of regional specific research and developmental projects befitting to the states
3. Integrated farming system approach to address livelihood / food / nutritional security
4. Emphasis on rainwater harvesting to enhance cropping intensity and year round employment
5. Focus on secondary agriculture for value addition of the tribal products
6. Promotion of organic farming
7. Development of small tools and implements for drudgery reduction

Valedictory Function

The valedictory function was chaired by Professor Debi Prasad Ray, Hon'ble Vice-Chancellor, OUAT. Dr. R.P. Singh, Secretary General, IAUA was the Co-Chairman with Prof. Goutam Kalloo, Hon'ble Vice-Chancellor, JNKVV, Jabalpur as the Chief Guest. Dr. Bibudha Parasar, Extension Education and Dr. Samarendra Mohapatra, Agri-Business Management of OUAT were the rapporteurs.

Dr. M.M. Panda, Dean of Research, OUAT presented the report of Inaugural Session and Technical Session-I while Dr. P.K. Rao, Animal Breeding and Genetics, Dr. C.S.K. Mishra, Zoology, Dr. Sanjay Kumar Das, Agricultural Processing & Food Engineering and Dr. Pravat Kumar Roul, Agronomy of OUAT presented the proceedings of the Technical Sessions II, III, IV, & V, respectively.

Dr. C.S. Chakravorty, Hon'ble Vice-Chancellor, WBUA & FS, Kolkata suggested not to cite the name of any specific company or Trade name in the final report. Prof. V.S. Tomar, Hon'ble Vice-Chancellor, RMVSVV, Gwalior suggested to make necessary modification with regard to tenures and retirement age of Vice-Chancellor i.e. should not be less than 5 years and less than 70 years, respectively. Dr. S.S. Chahal, Hon'ble Vice-Chancellor, MPUA & T, Rajasthan suggested for inclusion of the proceedings of General Body Meeting of IAUA in the final report.

Co-Chairman, Dr. R.P. Singh suggested limiting recommendations to maximum of 10 numbers which will otherwise confuse all concerned.

Chief Guest Dr. Goutam Kalloo, Hon'ble Vice-Chancellor, JNKVV, Jabalpur appreciating the very design of the convention as well as the symposium, stressed upon incorporation of biodiversity & economic factors as well as food and employment security in the recommendation and involvement of government and non government organizations for rendering a genuine service to tribal people.

The Chairman Prof. Debi Prasad Ray appreciated the deliberations made during the Symposium in perspective of Tribal Areas Development. He stated that Agriculture & Education both are being the state subjects, ultimately the respective state government will take care of the tenure & retirement age of the Vice Chancellors of SAU's when proper instruction is given by Government of India through Ministry of Agriculture and ICAR for that matter.

Some of the problems observed by him are (i) Scheduled tribe people once occupying higher position in the Government or in Society never look back / go back to their own community and also never think seriously about their community members, (ii) inaccessibility and language problem accompanied with superstitions made tribal development a difficult proposition & (iii) involvement of large number of middlemen in marketing system is a serious threat for tribal people when they strive to sale agricultural and forest products.

Finally, chairman suggested (i) Initiation of Networking Project or All India Coordinated Project for Tribal Area Research, covering both macro and micro level studies for solving the state specific tribal problems in tribal populated states and (ii) involvement of Krish Vigyan Kendra in imparting need based and problem oriented training in tribal pockets with emphasis on appropriate, acceptable and sustainable technologies.

The function ended with Vote of Thanks by Dr. M.M. Panda, Dean of Research, OUAT, Bhubaneswar on the occasion.

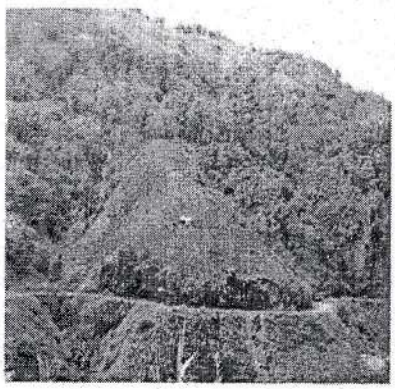
LEAD PAPERS

Main Problems of Tribal Farming

Prof. D. P. Ray, Vice Chancellor
Orissa University of Agriculture & Technology, Bhubaneswar-751 003, Orissa

The tribals are predominantly rural (92.60 per cent), poorest social group and overwhelmingly illiterate. They are the weakest among the weaker sections of the society because of the long periods of isolation and economic deprivation. Most tribes are concentrated in dense forests normally inaccessible with limited political and economic activity. Historically, most tribes practice subsistence agriculture or hunting and gathering. They trade with outsiders for few necessities such as salt, iron and cooking utensils. For tribal people, however, land was often viewed as a common resource, free to whomever needed it. In view of the altitude, topography, soil, climatic condition & non availability of adequate plain land for wet-cultivation, the tribal people are forced to practice shifting cultivation. All the socio-cultural and socio-economic activities of tribals are therefore centered on the shifting cultivation. Shifting cultivation is considered to be the most ancient system of agriculture dating back to the lower Neolithic period. It is also known as "*Field Forest Rotation*" or *"Slash and Burn"* agriculture. Shifting cultivation is practiced in some form or other in almost all the tribal areas of Orissa and particularly in dense forest & sloppy hill areas.

The land in the tribal region is divided into three categories *viz.*, hill slopes or top of hills are called, *Haru;* land at the foot of hills, called, *Penga;* and lands adjoining the hamlets are called *Bada* (Kitchen garden). In view of the terrain, the tribals mostly possess *Haru* – type of land rather than other categories of land which are very limited. Among all the land types, *Penga* type of land is considered to be the best category as regards fertility is concerned, since it contains black soil. Some well-to-do families raise hill-paddy on this type of land. (Source: *SC & ST Research & Training Institute, BBSR 2006 pp: 30-31*).

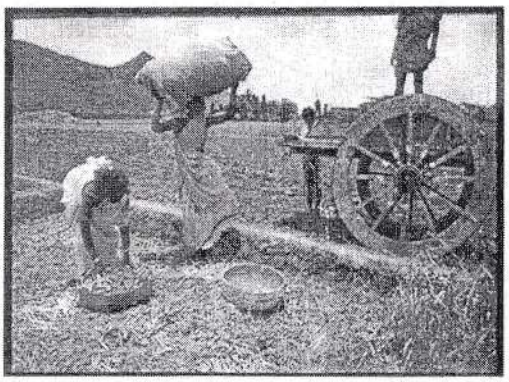


In terrace cultivation, the available hill slopes are fully used mainly for paddy cultivation and the available water of hill streams are tapped through terrace walls constructed with stones and boulders for cultivation throughout the year as the water flows from one terrace to another in down-ward motion. However, the availability of terrace land under the possession of a family is not adequate.

The land use pattern in tribal areas in Orissa & similar situations in the country can be summarized as follows.

Sl. No.	Types of land	Crops grown according to their importance
1	*Haru* (hill slopes or top of hills)	**Millets:** Ragi and fox-tail millet for Staple food. **Pulses:** Redgram or Kandul, and *Jana* Dal. **Legumes**: Cowpea, yard bean and rice bean for tiffin. Castor-seeds as cash crop for the tribals. **Roots & Tubers**: Saru kanda, Langala kanda and Rani kanda for food and surplus for sale. Turmeric, ginger and arrowroot are produced as cash crops for the tribals. **Vegetables:** Pumpkin, broad bean and Chilly for food & surplus for sale. **Fruits:** Banana, Orange, Jack-fruit and Pineapple as cash crops.
2	*Penga (foot of hills)*	*Dangar-Dhan* (Upland Paddy) for food.
3	*Bada (lands adjoining the hamlets)*	**Kitchen garden**: Gourd, pumpkin, bean, brinjal & chilly. The kitchen garden contains mainly mango and jackfruit trees.

(Source: *SC & ST Research & Training Institute, BBSR 2006 pp: 32*)

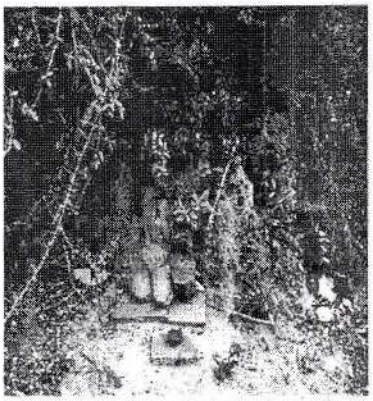


The tribals continue to maintain their traditional interest in wild fruits, tubers and nuts although in recent times there have been a steady decline in availability of various forest produce owing to large scale deforestation and continued practice of shifting cultivation. In fact, their food is greatly supplemented by fruits, roots and tubers collected from the forest. Food collection from forest is still an indispensable part of the economic life of tribals. Most of the poor tribal families depend on forest collection for about six months in a year. Some of the edible items collected from the forest are fruits (Mango, Jack fruit, Anola, Kendu etc.) various edible leaves, roots & tubers (Kanda), Mushrooms and Honey. Besides, they hunt for birds, animals and reptiles. The food materials collected from the forest have seasonal variation. Fruits are plenty in summer, while green leaves and mushrooms are plenty during rainy season & roots and tubers during winter.

Activities connected with the collection of food items are exclusively confined to the members of the family. Both men and women participate in the pursuit. Chase-dog is the constant companion in the annual ceremonial hunting drive which takes place in the months of March-April.

Problems of tribal farming

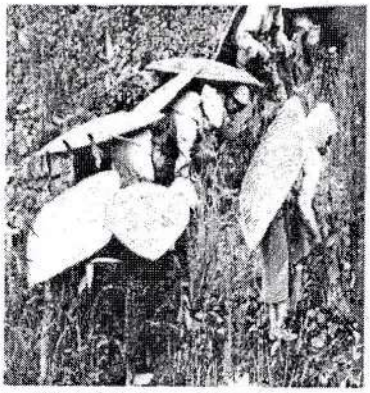
Religious beliefs and Practices



The success of agriculture by tribals depends largely on their religious beliefs which hinder adoption of modern agricultural practices/techniques like seed treatment, chemical fertilizer application and modern plant protection measures etc. It consists of regular propitiation of Gods, Spirits and *Manes* and performances of rituals. Male & female spirits are worshiped for good agriculture and bumper crops. Goddess *Laxmi* is worshipped during the full-moon-day in the month of December after all the crops are harvested. The housewife worships *Sita Penu* (*Penu* - Goddess) with all new seeds which are kept in the *Tumba* (a vessel) and the old seeds mixed with new seeds are sown again. *Jatraakudi Penu*, a male deity at the outskirt of the village under a bamboo shade at the western end is considered to be very arrogant even for a trifling error or negligence. He brings drought and other natural calamities to the village and is worshiped in each month with adequate sacrifices to cool down his temper. Instead of trying for new practices or methods for bumper harvest, they rely on Nature God and rituals for getting good harvest which ultimately results in poor harvest. Intensive literacy drive can remove blind belief from the minds of tribals.

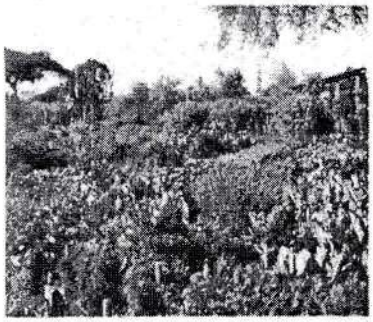
The important constraints of low productivity are, existing farming system, low level of adoption of modern agricultural technologies, low input use, low labour efficiency and lack of exposure to other farm enterprises.

Shifting Cultivation



Shifting cultivation is a primitive method and an age-old practice, particularly being followed in the Eastern Ghats. Orissa accounts for the largest area under shifting cultivation in India. Based on the task force of Government of India report, more than 30,000 sq km of land (about 1/5 land surface of Orissa) is under such cultivation. Shifting cultivation is prevalent in Kalahandi, Koraput, Phulbani and other southern and western districts, covering 119 blocks of Orissa particularly by the *Kutia Kandha* Tribe. The forest on the hill slopes selected for cultivation is cleared by slashes and burn method by the adult male members of the family in the months of February. The head of the family assumes all the responsibilities in the practice and operation of shifting cultivation. The adult males, between 18 and 50 years of age undertake the strenuous work of cutting tree, ploughing, hoeing and watching crops at night where as females attend to cutting the bushes and shrubs, cleaning of seeds for sowing, weeding etc. Cultivation is done with the help of digging instrument called *Sechu*. The fruit-bearing trees like, mango, jack-fruit, tamarind and mahua are spared. These

patches are cultivated for consecutive 3 years and then abandoned for a period of 6 years after which the same process starts in a cyclic manner. The seeds are dibbled into the ash covered soil. In the first year bumper crop is harvested. The crop yield in the second and third year reduces as no FYM or chemical fertilizer is added to maintain soil fertility. On the fourth year the patch is abandoned for recuperation. After abandoning the old patch a new patch on the hill slope is selected for cultivation. The family returns to the previous site after 6 to 7 years. The Kutia Kandha build a hut on each shifting cultivation site which serves as a rest shed during working hours and guarding the crop form the wild animals.



The *Desia Kandha* (another tribe in Orissa) practice four types of cultivation namely, (1) shifting cultivation on the hill-slopes and hill-tops, (2) cultivation on the flat hill-tops and foot-hills called *Dahi* cultivation, (3) Dry and Low land cultivation and (4) backyard cultivation. Every *Kandha* village has its own territory and the hills located in it belong to the village. It is on these hills that shifting cultivation is undertaken. Growing of mixed crops is rather the rule in shifting cultivation than exception. Sowing by broadcast is common. But, the seeds of *Kandula* (arhar) and beans are dibbled in holes dug with sufficient interval of space. The bean seeds are dibbled in holes around the dead trees that still stand over in the field. Formerly, the recuperative cycle by these tribes was 15 to 20 years, but it has been reduced to 7 to 10 years which results in diminishing return & harvesting of nutritionally deficient crop.

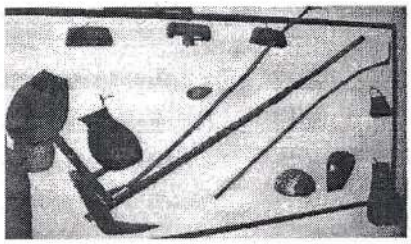
Repulsion to Modern Plant Protection Methods

Modern methods of plant protection being practiced by neighbouring non-tribals are repulsive to most of the tribal farmers. Application of pesticides in neighbouring crop fields drives away pests to untreated crop fields of tribals resulting in heavy crop damage and yield loss. Under such a situation, the tribals pray their deities to control insect pests, plant diseases and guard their crop. They also apply indigenous medicines to keep their crops healthy. Their perception on pest attack is also influenced by blind belief. For example, the "Silver Shoot" of paddy resulting from the attack of gall midge is regarded as something supernatural by some tribes and certain ceremonies are performed in the field and at home to ward off this trouble. When a swarm or locust fly over a crop, it is believed as a crop devastating act by the Gods and certain rites are performed to propitiate the angry Gods.

However, some of their crop protection practices have specific values. As for example, use of twigs and barks of *Karada* (*Cleistanthus collinus*) in paddy fields prevents rice hispa, rice case worm and other bugs. Leaves of Begonis (*Vitex negundo*), neem (*Azadirachta indica*) and Maha neem (*Melia azadirachta*) are used for protecting stored grains. Cow dung ash mixed with pulse seeds are used to prevent attack of pulse beetles. Even when effective chemical pesticides are available within easy reach of the tribals, they do not accept those and prefer their indigenous practices which often are less effective.

Tribals understand the loss that the chemical pesticides have caused to them. They have observed death of the fish and snail in the paddy fields and pollution of water in the tanks used for drinking purpose. Use of pesticides have caused large scale killing of earth worms those loosen and fertilize their soils (*SC & ST Research & Training Institute, BBSR 2006).* Their stand may be genuine regarding protection of environment but considering need for enhanced crop production from diminishing and degrading land, need based plant protection measures are required to be adopted rather than leaving it at the mercy of Gods. Scientific validation of traditional methods of crop management should be given priority for the tribal farming research.

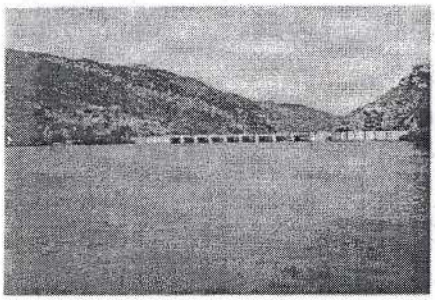
Use of Traditional Agricultural tools & implements

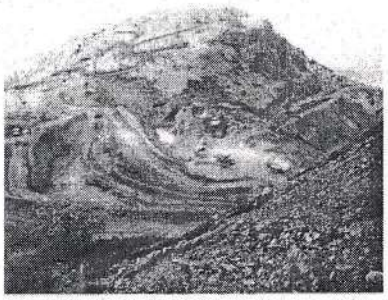


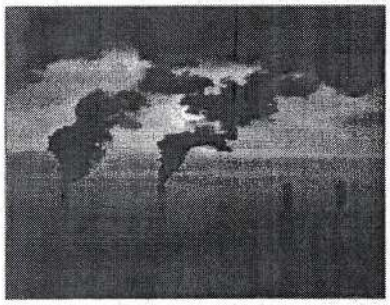
The tribals use locally manufactured agricultural tools and implements like plough, spade, yoke, crowbar, sickle, axe, leveler, etc. instead of using modern agricultural tools and implements for drudgery reduction and enhanced efficiency. In most of cases they lack awareness and even if they are exposed, they do not easily divert from their traditional tools and implements.

Diversification of land to other uses

Deforestation and its ill-effects have been further aggravated by big dam projects for irrigation & generation of electricity, mines and establishment of industries, which not only acquired and destroyed forests that tribal communities had preserved for centuries for agriculture, livelihood and shelter, but also displaced the communities. The displacement has aggrieved the local tribal populations and they are raising voice collectively against that. Various social activists perhaps are taking advantage of their innocence and resistance to change. Besides, land acquisition has forced the indigenous tribal population to take up cultivation on more unproductive steeper hill slopes and hill tops causing huge amounts of soil erosion and further deforestation. Amicable rehabilitation, aggressive livelihood promotion and judicious land use strategies should be taken up for protecting tribal farming.







Effects of Climate change

The shifting cultivation system has been developed through ages in tune with the climatic conditions of the hilly forest areas, where monsoon season is the main agricultural season, characterized by a continuous drizzle for 4 to 5 months of the year. It provided continuous moisture necessary for hill slope cultivation. Tribal knowledge systems also had a deep understanding of the crop rotation practices required to maintain the shifting cultivation cycles at the optimal level. In the lowland paddy areas tribal communities have developed indigenous systems of water management and crop optimisation, combining long duration and short duration varieties that enables the crops to withstand the high water currents of the monsoons in the valley bottom land, while optimising land use (Das and Das, 2009).

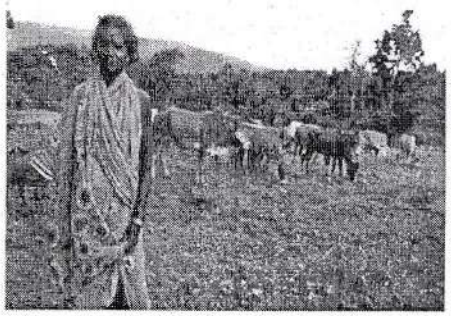
Climate change has also influenced the rainfall patterns in the tribal dominated regions, affecting cultivation practices and the fragile geo-physiology of these regions. In recent years, the pattern of gentle rain for long periods has been replaced by cloud bursts and heavy downpours that cause huge soil loss, destroying upland crops and inundating valley bottom fields. The hill slopes on which they used to grow a variety of crops have turned to barren patches of rock and rubble. All this has brought the tribal communities, to the brink of starvation for several months in a year. Checking of commercial felling of trees and adoption of soil & water conservation measures including conservation agriculture would slow down the adverse effect of climate change.

Land Ownership

In the past, land in the tribal areas had not been surveyed and settled. Therefore, the tribals freely practiced shifting cultivation in their respective habitats assuming that land, forest, water and other natural resources belong to them. Among some of the tribes, land & other resources were owned jointly by the community and the annual distribution of plots on the hill slopes for shifting cultivation were being done on mutual basis. In certain tribes, lands and other natural resources were under the control of the village head, which on approach were allotted for use by individuals. Since the evolution of Indian Forest Policy in 1952 and completion of survey and settlement of land in tribal areas, the traditional tribal land tenure system has dwindled. The tribes therefore, now have limited land and forest resources for the practice of shifting cultivation and for carrying out their age old practice of hunting, collecting, gathering activities, etc.

Land dispute between tribals and non-tribals has taken violent turn in recent past in several parts of Orissa. Forest land owned by the tribals for agriculture are said to be unauthorizedly occupied by the non-tribals in various parts of Orissa which is a major cause of such violence. Besides, a major cause of confrontation between the tribal people and the Governments has been the difference in the perceptions about the rights of the tribal people over the forests and their use. This right is the very essence of human civilization (B. D. Sharma, 1990 SC/ST Commissioner). Their only desire is to be allowed to live in their ancestral homes without interference. These are some of the issues to be resolved for restoration of tribal agriculture and bring peace in disputed areas. Fortunately, the Government has recently implemented an Act to give land rights to tribals in forest areas and settle disputes.

Livestock farming



Lack of sufficient pasture land, marketing facilities, adequate credit facilities, scientific knowledge and un-remunerative price for the livestock products are the major constraints perceived by the tribal farmers. Establishment of more milk co-operative societies, enhancing fodder cultivation, provision of loans to needy tribal livestock farmers at reasonable interest rate and conducting awareness programmes among tribal farmers on various scientific livestock management practices will lessen the prevailing constraints and will improve the tribal livestock production.

Marketing Problem

Commercial highways and cash crops frequently drew non-tribal people into remote areas. By the 1960s and 1970s, the resident non-tribal shopkeepers were a permanent feature of many tribal villages. Since shopkeepers often sell goods on credit with high interest during dearth period, many tribal members have been drawn deeply into debt and mortgaged their land. Non-tribal merchants also encourage tribals to grow cash crops (such as cotton or castor, turmeric,

ginger etc.), which increases tribal dependence on the market for basic necessities. Because of their illiteracy, the tribals sell their agricultural produce to the non-tribal merchants at a very low price to get rid of their debts. Lack of Government efforts to provide adequate fair price shops in the tribal areas is a major reason of poor agricultural growth in the tribal areas. Improved communication, motorized traffic, minimum support price & fair price market yards in large numbers in tribal areas can improve the situation.

Language Barrier

The diffusion of the knowledge of improved agriculture is limited by the communication gap due to local language barriers in tribal society. Very few Village Agricultural Workers and Agriculture Extension Officers know the tribal language to communicate technology.

Addiction to country liquor

The tribals usually have addiction to country liquor. They opt for country liquor in lieu of food. Males usually drink country liquor, sleep and keep themselves idle. Females are the major workforce in tribal families. It is therefore essential to promote women SHGs.

Inappropriate Technology

A large part of the gains from improved technologies could not be realized in the tribal areas which might be due to the fact that many technologies generated at experimental stations may not be appropriate to the agro-socio-economic and cultural conditions of the tribal farmers for whom they are intended to. Innovation of techniques, their diffusion, acceptance and proper utilization are all linked to the structure of society, its values and the personality structure of tribals.

Future Thrusts

Organizing tribal people into a network will be the next stage of support to facilitate transfer of technology, marketing and value addition. The village commons can also be transformed to Family Farms by *Mahila Mandals* which can be integrated as a family or *Kutumb*. If the whole village converts all the arable lands around the village into Family Farms with application of Organics and practising Conservation Agriculture, then it will be converted into an Eco-village which is a global phenomenon. This will not only maintain a productive agriculture to meet the challenge of food security, but also strengthen its place in the competitive global agricultural markets by producing more organic produce.

Tribal farmer live under complex diverse risk prone agricultural systems. There is a need of popularizing integrated farming systems in these areas through participatory approach.

Conservation of rich genetic diversity of the tribal regions assumes great importance due to natural biodiversity loss. Supplementation of ex situ conservation approaches in form of sacred grooves, heritage trees etc. should be done. Reward and recognition have to be done for the present and past contribution of tribal communities towards conservation of precious genetic resources.

Conservation agriculture and afforestation can be promoted to derive benefit to tribal communities through carbon trading.

Protection of farmers' varieties and extending the benefit to tribal communities through National Gene fund can be aggressively taken up.

Bio-prospecting of precious medicinal plants and extending the benefit to the owners of traditional knowledge is another area deserving attention.

Literacy rate need to be enhanced in tribal belts to remove blind believes. Education particularly in the field of Agricultural vocation will generate self employability and quick adoption of modern agricultural technology through fellow farmers. Drives to remove illiteracy and addiction to country liquor have to be made very seriously.

Technological knowledge need to be translated in local language to convince tribals easily for quicker adoption of technology. Market support policies are required to be implemented to make tribal agriculture remunerative. Besides, research on "Tribal Farming" need to be strengthened to meet the specific requirement of the tribal area.

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Social system and living condition in tribal areas with reference to Chhattisgarh

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Scheduled Tribes, Scheduled Castes and denotified tribes constitute the weakest section of India's population, from the ecological, economic and educational angles. They constitute the matrix of India's poverty. Though the tribals are the sons of the same soil and the citizens of the same country, they born and grow as the children of the nature. From the historical point of view, they have been subjected to the worst type of exploitation social. They are practically deprived of many civic facilities and isolated from modern and civilized way of living since so many centuries. The British rulers really did something in providing certain facilities in villages and towns such as, education, transport, communication, medical etc. though inadequate and mainly with self-interest. But it did nothing for ameliorating the socio-economic conditions of tribal people, except to the people in North- East region of the country, because of certain reasons. Firstly, the British administrators thought it expedient generally to leave the tribals alone, as the task of administration in the hill areas was difficult and costly. Secondly, it was considered desirable to keep away the tribals from possible political influence from the world or outside world. Thirdly, some of the British officers genuinely felt that left to themselves, the tribal people would remain a happier lot. The Scheduled District Act of 1984 had therefore kept most of these areas administratively separate, the same situation was allowed to continue under the Govt. of India Acts of 1919 and 1935. However, after independence this policy was abandoned and new policy of tribal development and integration was initiated. The Constitution of India has made definite provisions for the welfare and uplift of the tribal people throughout the country.

Tribal Population and communities

Tribal are found in many regions of the world and majority of them are the poorest amongst poor. But in fact, the largest concentration of tribal people, anywhere in the world and except perhaps Africa is in India. There are approximately two hundred million tribal people in the entire globe, which means, about 4% of the global population. According to 2001 census, the population of Scheduled Tribes in the country was 84.33 million, consisting about 8.2% of total Indian population, which means about one tribesman for every 13 Indians.

Indian Anthropological Survey has identified 532 scheduled tribal groups and their sub-castes in country though the total numbers of tribal communities are reported to be 642 and several of them have become extinct or merged with other communities as the tendency for fusion and fission among tribal population is a continuous process. Thus, if the sub-tribes and state tribes will be taken into consideration, the number will be many more. These 532 communities speaking 106 different languages have been so far notified as the scheduled tribes under Article 342 of the Constitution of India in different States and Union Territories of the country. (IDSP 2003). These tribal communities are located in five major tribal belts across the country. The main concentration of tribal people is the *Paper presented in National Symposium on ' Tribal Area Development' during Indian Agricultural Universities Association(IAUA) Vice Chancellors' convention held at OUAT, Bhubaneswar (Orissa) from 7-8 November, 2010.* central tribal belt in the middle part of the India and in the north-eastern States.

However, they have their presence in all States and Union Territories except the State of Haryana, Punjab, Delhi and Chandigarh. The predominantly tribal-populated States, where about 50% of the tribal population of the country is concentrated are Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar and Orissa. Besides, there is a sizeable tribal population in Maharastra, Gujarat, Rajasthan and West Bengal.

Nature of tribes and their status

Any local social group which resides in a common geographical area, speaks a common language and behaves according to a common culture is known as tribe or tribes are a social group which has a distinct language, unique culture and an independent political organisation. In addition to this various sociologist, psychologist, anthropologist, government agencies and other scientists who are working in tribal areas have been defined the tribes from various ways according to their features like migration, language, culture, customs, etc.

Historically, tribal communities were characterized by a lifestyle distinct from agrarian communities. They subsistence on different combinations of shifting cultivation, hunting and gathering of forest products: all activities closely linked with forests. Their cultures celebrated and fostered this close bond with nature while also emphasizing communal ownership and consumption, closely-knit kinship structures, and minimal hierarchies.

Tribal people live in geographical isolation mostly in remote, inaccessible hilly areas. They are referred to as backward, due to their lack of capacity to utilize the opportunities of development offered to them. They are illiterate, have traditional beliefs and constitute the poorest of the poor segment of the Indian population (Mutatkar RK 2004). On the basis of above the tribes can characterized as: They usually reside in remote place far from civilized world, each group have one tribal language, have relation with any species group of Negroto, Astreloid or Mongoloid, their groups have own name and organization, rules & taboos of respective behaviours, they have primitive religion, in which prayers of spirits have an important place, have their own common culture and protection organizations, they have special fonding for liquor and dance and they adopt the tribal business like collection of useful natural produce, hunting, etc. Tiwari (2001).

Current Scenario of Tribals in Chhattisgarh

The State of Chhattisgarh was created by the Madhya Pradesh Reorganization Act of 2000. Total state population is 20.7 million (about 2% of India total) and it has a geographical area of 135,191 sq kms. It is the 9th largest state in India. Although considered one of the poorer states in India, Chhattisgarh is well endowed with resources that have yet to be exploited. Over 32% of the state's population is tribal, classified as indigenous people.

Demographic Trends: According to 2001 census, the Scheduled Tribe (ST) population of Chhattisgarh State is 6.62 million constituting 31.76 percent of the total population (20.83 million) of the State. Out of total ST population of India, its 8.44 per cent resides in the State. Chhattisgarh holds 7th position in the country regarding the total population of STs residing in the State, after Madhya Pradesh, Maharashtra, Orissa, Gujarat, Rajasthan and Jharkhand. The State holds 8th position among all the States and UTs in term of the proportion of ST population to the total population, after Mizoram, Lakshadweep, Nagaland, Meghalaya, Arunachal Pradesh, Dadra & Nagar Haweli and Manipur. It means that percentage of STs population in Chhattisgarh is

much greater as compared to its surrounding states. The decennial growth of ST population has been 15.7 per cent, which is 2.6 per cent lower than the overall growth of population (18.3 per cent). The State has a total of forty two (42) Scheduled Tribes and 7 primitive tribes groups (PTGs) all have been enumerated at 2001 census. The recognized primitive tribes (PTs) in the state are Pahari Korwa, Baiga, Avujhmariya, Bhariya, Kamar, Sahariya and Birhor.

As many as 94.7 per cent of ST population resides in rural areas. At the district level, tribals have their highest concentration in Dantewada (78.5 per cent) followed by Bastar (66.3 per cent) and Jashpur (63.2 per cent) districts. Janjgir-Champa district has the lowest proportion of tribal population (11.6 per cent).

***Different ScheduledTribes and their Location in state*:** Out of forty two (42) tribes, Gond is the most populous tribe with a population of 3,659,384 constituting 55.3 percent of the total ST population. Four other STs in descending order are Kawar, Oraon, Halba and Bhattra. Along with Gond, the five STs constitute 84.3 per cent of total ST population of the State. Binjhwar, Korwa and Sawar have a population ranging from 100,692 to 104,718. Together, they form 4.6 per cent. Ten STs, namely, Bharia Bhumia, Nagesia, Baiga.....to Kharia having population in the range of 88,981 down to 41,901, constitute another 9 per cent of total ST population; remaining twenty four (24) STs along with generic tribes constitute the balance 2 per cent of total ST population. Nine tribes have below 1000 population. Of them, five tribes, namely, Sonr, Damor, Karku, Andh and Bhil Mina are very small having population less than 100.

At the district level, Gonds have registered their high population in Bastar, Dantewada, Kanker Surguja and Raipur districts. Kawar are mainly concentrated in Surguja, Raigarh and Korba districts. Other three major tribes, Oraon, Halba and Bhattra have the highest concentration in Jashpur, Durg and Bastar districts respectively.

Existing Social system

Religion and Caste: Hinduism is the predominant religion (93.7 per cent) of the tribes of the State. Christian tribes have a share of 4.7 percent. The tribes professing 'Other religion and persuations' and Islam constitute 1.4 per cent and 0.1 per cent respectively (Office of the Registrar General, India)

Religions: Currently in two agro climatic zone (Bastar plateau and Northern hills) of the state around 50 percent of total population is tribal. At present many tribes and their sub caste (*like- Maria, Muria, Bhatra, Parja, Gadva, Halba, Ganda, Mahra, Chandal, Ghuruva, Dom, Lohar, Matrigond, Rajgond, Dorla, Nahar, Naikpod, Kuduk, Andkuri, Kumhar, Kosta, Chamar, Kenvat, Dhakad, etc.*), along with some other castse (*Brahmin, Vaishya, Kayasth, Teli, Kalar, Kshtriya, Kunbi, Dhobi, Marathi, Mohammedan, Pathan, Telanga, Orria and Rohilla etc*) are residing in the area.

Languages: The chief languages used among the tribals are, Halbi, Gondi, Chhattisgarhi and Hindi. The Halbi is an important language and it is a compound form of Hindi. Bhatri is the main branch of Halbi language. There are a lot of words taken in this language from other languages like Sanskrit, Hindi, Arabic, Pharsi, etc. The other languages like Bengla, telugu, oriya, etc. are also popular in the area due to the effect of adjoining states.

Sex Ratio: The over all sex ratio of the ST population in Chhattisgarh is 1013 females per 1000 males, showing the preponderance of females. This is significantly higher than the national average of 978 for the total ST population. At individual level, females outnumber the males among all the five major tribes, having over all sex ratio above 1000. The sex ratio among STs, in the age group 0-6 years (998) is higher than that of the national average. All the major tribes have recorded child sex ratio higher than the national average with Gond and Bhattra having predominance of female children.

Literacy & Educational Level: The overall literacy rate of the STs is 52.1 per cent at 2001 census. This is higher if compared to 26.7 per cent recorded at 1991 census. This percentage is also higher than that of all STs at the national level (47.1per cent). The male as well as female literacy rates (65 per cent & 39.3 per cent) among the STs are also higher than those at the national level (59.2 per cent & 34.8 per cent).

The data on different levels of education attained by the tribal literates show that slightly more than half (50.5 per cent) of tribal literates are either without any educational level or have attained education below primary level. The proportions of literates who have attained education up to primary and middle levels are 26.3 per cent and 12.3 per cent respectively. Person's educated up to secondary/higher secondary constitute 8.8 per cent only. Percentage of ST literates who are graduates & above is only 1.9 per cent.

The data on education levels attained by all STs show that the proportion of the tribal literates decline sharply after the primary level. Percentage of literates in middle school is less than half of the primary level literates. These proportion further declines to a considerable extent from secondary level onwards.

Family structure: Fragmentation of farm families is common feature in the tribal area. Increasing demands and low income of the family are the major reasons for fragmentation in farm families. Therefore, tribes are residing in the villages in nuclear as well as in joint family system. With regard to size of family, there are five members in majority (54 %) of the farm families. About 44 per cent respondent's families were having 6 to 10 members, whereas less than 2 per cent families were having more than 10 members (Khan, 2001 and Sahu, 2010). Majority of the families are male dominant but the female are also have important role in family management. The oldest person was head of the family and all other members used to obey his orders. The oldest person of the family had full authority of all financial matters.

Work Participation Rate (WPR): The Work Participation Rate (WPR) of the ST population is 53.4 per cent which is lower than that of all STs at the national level (49.1 per cent). There has been a marginal decennial decline of 0.7 per cent in the WPR. Male (56.7 per cent) as well as female work participation rate (50.2 per cent) among the tribes are higher than the corresponding figures (53.2 per cent and 44.8 per cent) recorded for all STs at the national level. Among the total workers, 67.4 per cent are main workers and this proportion is marginally lower than that of all STs at the national level (68.9 per cent).

At the individual level, among the major tribal groups, Gonds have WPR (54.2 per cent) more than the state average whereas Oraon, Halba and Bhattra have recorded WPR below the state average.

Category of Workers: More than half (56.6 per cent) of the total tribal workers are 'Cultivators'. This figure is higher than that of the country (44.7 per cent). 'Agricultural Labourers' constitute 32.7 per cent, which is comparable with the national average of 36.9 per cent. 'Cultivators' and 'Agricultural Labourer' together constitute 89 per cent of the total tribal workers. 'Other workers' account for 9.7 per cent only. This proportion is also considerably lower if compared to the national average of 16.3 per cent. Workers engaged in Household Industry (HHI) account for a meager 1.2 per cent, which is lower than that of all STs at the national level (2.1 per cent).

Among the major tribes, Kawar, Oraon, Halba have more than 60 per cent workers are 'Cultivators' followed by Gond. Bhattra have the highest proportion of 'Agricultural Labourer'.

Existing Marriage systems and Customs at Death

Marital Status: Marriages of girls and boys below the legal age for each are rarely practiced among the tribes of Chhattisgarh. While the proportion of the married girls below 18 years (1.5 per cent) is slightly lower than the national average of 2.1 per cent, the proportion of married boys below 21 years (2.7 per cent) is almost equal to that of all tribals at the national level (2.8 per cent).

Marriage System: Like all other cultured casts the marriage ceremony is very important in the tribes. In general a man had only one wife. But in higher class like dynasties and landlords more than one wife was allowed. In Halbas two types of marriage are popular name brief marriage and detailed marriage. In Bhatras four types of marriages are popular named arrange marriage, love marriage, widow marriage and dhariya marriage. In Murias and Gonds arrange marriage, love marriage and kidnapping marriages are popular. In tribes if any woman choose new husband then the new husband gives money to the old husband as compensation allowance. This compensation is settled by the leader of caste. In tribes the marriage of widow is also popular. In Halbas any widow can not be married with any unmarried person.

In tribes there is a popular tradition named 'Ghotul'. Ghotul is a cultural centre of Gonds and Murias. It is used as a meeting centre of brides and grooms. Every groom of Ghotul is called Chelick and every bride of Ghotul is called Motiyari. Previously the Ghotuls were of two types first in which the relations were permanent and second in which the relations were changeable. The leader of male members in Ghotul is called Siredar and the leader of female members in Ghotul is called Belosa. The name of God of Ghotul is Lingo. The establishment of Ghotuls was done for the education of children, to develop qualities in them and for the selection of life partner. Sex education is also given in Ghotuls.

Customs at death: In all tribes the customs of death are so much complicated. In maria they bury the dead bodies. Suppose any lady get die during her pregnancy then her body is mourned. Suppose any child who is younger than 5 years then his body is also mourned beneath of Mahua tree and his head placed toward east direction. They constructed a little tomb on that place in memories of dead person. The Gonds placed the legs towards south in mourning. On the death of any wealthy or old person the people kill any cow or bull and cut their tail and this tail is kept in the hand of dead body before mourning. In some tribes they placed some wooden poll in memories of dead person.

Cultural System

Festivals: Several festivals are popular among tribal communities in the state. Some more festivals are

Madai Festival: Madai is one of the famous festivals of tribal region held in the different villages extending from Mandla to Bastar. It's quite popular among Gond tribes of Bastar and thousands of devotees gather under the shade of a sacred tree to sacrifice a goat to the mother goddess and the whole night is spent in dancing, eating and making merry. This festival is a moving festival and moves throughout the Bastar plateau regions from December to March. The festival celebrated in the respect of local God and Goddess. This festival is celebrated in a big ground where thousand of peoples can go simultaneously. In starting tribes arranged a procession of local God or Goddess after that the worship is done and then the festival starts. A lot of shops, restaurant, crafts, dances and other cultural program can be seen in this festival. Outsider people come to that place and enjoy in the festival. Although the festival is of tribes but all the communities have faith, celebrate and enjoy the festival.

Hareli: Celebrated in the month of 'Shravan', Hareli is a symbol of agricultural prosperity. Farmers worship farm tools and cows on this occasion. They place branches and leaves of 'Bhelwa' (a tree resembling cashew tree) in the fields and pray for good harvest. People also hang small Neem branches at the main entrance of houses on this occasion to prevent occurrence of seasonal diseases.

Pola: Pola follows Hareli. It is celebrated by worshipping bullocks. Children play with idols of Nandi bull (the vehicle of Lord Shiva) made of clay and fitted with clay wheels. A bull race is a major event of the festival.

Bastar Dusshera: It is one of the most popular festival among tribas and other communities of the state.

In addition to above, other festivals like Mati-tihar, Gobar-boharani, Ramnavmi, Navakhani are important. Festivals(Gathering on a common holy place) like Ramaram Mela, Marai, Phagun Marai, Mahashivratri Mela, Sakalnarayan Mela, Goncha, Dusshera, etc. are popular in the area. Dusshera, Diwali, Holi are celebrated as usual like the other parts of India.

Art and culture

Currently in two agro climatic zone (Bastar plateau and Northern hills) of the state around 50 percent of total population is tribal. So the most of the culture of these areas are tribal dominant. Although in this modern era the culture has slightly changed.

Art: Many wonderful forms of local handicrafts, including wood crafts, bamboo (include agricultural implements, fishing traps, hunting tools and baskets), Bel metal crafts and ornaments are popular in the state and in country.

Cock fighting: Hen fighting is the most popular source of entertainment in rural area among tribals.

Local Leadership and Institution Pattern

Traditional leadership: The settled tribes in the state have at least two levels of traditional leadership - within the village and for a cluster of villages of the clan for dealing with inter-village issues and disputes. Some of them also have a third and higher leadership level for addressing issues confronting the larger community. In almost all the settled tribes, the posts of the traditional leaders are hereditary often reserved for the male lineage of the `original reclaimers' of the land. The traditional village assembly has virtually been an all-male institution with women provided access only under highly exceptional circumstances.

Modern leadership and Institutions: By far the single most pervasive modern village institution introduced in post independence India has been the *Gram Panchayat* as the lowest rung of local government.

New Institutions Promoted by NGOs and Governments: with increasing recognition of the importance of people's participation for increasing the effectiveness of development interventions, an extensive array of `people's' institutions have been created in the villages for the implementation of sectoral programmes. These include joint forest management (JFM) committees being set up by the Forest Department, education committees by the Education Department, watershed associations and committees by the DRDA, water and health committees by the Public Health Department, water users association by the Irrigation Department, and Mahila Mandals (women's associations) by the Women and Child Department, etc.

LIVELIHOOD SYSTEMS

Livelihood systems in the tribal area are primarily dependent on various combinations of agriculture, forests and labour. Livestock and fish rearing are closely integrated in the farming systems. There are also a number of artisanal castes and tribal groups who depend either on providing services to the community or on small-scale processing and marketing. The traditional livelihood system of the PTGs consisted of shifting cultivation, hunting and gathering forest foods and other produce. They are undergoing a painful process of enforced transition to settled cultivation outside the forests. Although many still depend to some extent on hunting and forest products, these are no longer their main source of livelihood. Instead they are grappling with survival on poor quality non-forest lands without agricultural implements. Women's work is regarded as crucial for the survival of tribal households in terms of provisioning for food, income earning, as well as management of resources.

Typology of Livelihood Systems

The tribal livelihood systems identified in the area can be classified according to the degree of dependence on forest resources.

Forest dependent upland systems: Usually located in upper parts and dense forest areas where most PTG Villages are located. Communities in these areas live in small, scattered settlements located near or within reserve or protected forests. PTGs in such areas are under transition from pure forest dependence to a mixed forest/agriculture/wage labour system due to resettlement, and declining forest productivity. Characteristics include a continuing dependence, often unsustainable, on harvesting of firewood and some NTFPs such as roots/tubers, bamboo, tendu, sal leaves and fibre collected for consumption or sale. Limited permanent or shifting cultivation is practiced within a defined village forest territory, providing food security for 2 to 4 months. Small stock consists of poultry, pigs and goats which are sold when cash is needed.

Mixed systems: Located in middle to lower part of the area. These are partially hilly areas with communities having lesser dependence on forest than the former and in place of this there is added reliance on agriculture. Farming is mainly single crop with some paddy and vegetable cultivation. Some farmers may own bullocks and use manure for maintaining soil fertility. Food security extends to 3 to 4 months. Access is interrupted at certain times of the year and so market orientation is somewhat limited with a greater focus on subsistence production.

Lowland systems: Located in lower part of the areas. These communities extend into the lower plains and may have relatively little forest access. They tend to be more multiethnic, have smaller but more intensively farmed landholdings and own more bullocks. Double cropping is more common and, where irrigation is available, even a third crop may be grown. There is a greater reliance on paddy, vegetable cultivation occurs year round and overall food security can extend to 5 to 7 months. A much greater market orientation is present due to year-round market access. Many fields may already be bunded as the terrain is generally flatter and there is better information about water management techniques. In general, farming has been carried out for a longer period and this is demonstrated in greater productivity per hectare. Distant migration may be less prevalent with greater availability of wage work locally.

Land Holding Patterns: Broadly speaking, holding patterns of tribals tend to be more egalitarian and holding sizes smaller. About 75% of the tribal households have firm title to their land. Land tenure issues mainly concern `encroached' forest land.

Agricultural Production Patterns. Agriculture in the tribal area is predominantly rainfed and monocropped: Nearly 10% of the cultivated land in tribal area is under irrigation. Less than 20% of the gross-cropped area is double cropped. Paddy is the major crop accounting more than 70% of the cultivated land during the *kharif* season, with productivity ranging from 450 kg to 2500 kg/ha. The other crops are maize, a variety of millets, sorghum, wheat, barley, pulses and oil seeds. Food grains occupy about 95% of the cropped area. Paddy, maize, millets, arhar, niger and groundnut are the important *kharif* crops while the main crops grown in the *rabi* season are wheat, oilseeds (rapeseed, mustard, linseed, groundnut, pigeon pea and niger), pulses (lentil and gram), and vegetables. Horticulture is little developed in the tribal area. Women participate in all agricultural operations excepting ploughing and sowing of rice seed, contributing between 70 to 80% of the total labour.

Badi System (Homestead): To meet out the daily needs up to some extent, the *badi* system is a popular cultivation pattern in tribal area among each established family. Fenced cultivable and fertile land (< 1 acre) surrounding the house is known as *badi*. The badi are utilized by family to grow the Vegetables, seasonal fruits, plantation crops (like sulfi, coconut, etc), pulses, oilseed crops, maize, millets, etc.

Adoption of Indigenous technologies: A Majority of the tribal farmers in the area are still also using several indigenous agricultural technologies from seed selection to storage of produce. Some of these technologies like use of locally made implements, sun drying; use of salt solution for selection of healthy seeds, operations for weed control, seed germination test, use of herbs/plants to control insects and use of neem leaves as insect repellant are popular among the tribals (Sharma *et al.*, 2000).

Income and Expenditure Pattern: The average annual income of tribal of Bastar Zone was worked out to Rs. 27,786(Sahu 2010). The income a person earns after all his hard work and efforts are spend to meet out the various needs and purposes of the family. Depending upon the income and the necessity, the prioritization is done for the various expenses and accordingly expenses are done for various purposes. When expenditure was studied it revealed that 69 per cent expenditure was incurred for various domestic purposes and only 12 per cent in agriculture (Sahu 2010). On social ceremonies 7 per cent was the expenditure, and on house repairs and maintenance 2 per cent was spend, while on liquor and smoking the total expenditure was 4 per cent. Less than 3 per cent of the total earning was spent on education and treatment and medicines. Four per cent expenditure was done on miscellaneous items like fuel, jewellery, newspaper/ magazines, savings, etc. Thus annual expenditure of the respondent's family was Rs. 27,786.

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Creating Job Opportunities Through Processing Value Addition and Marketing System in Tribal Area

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ABSTRACT

The infrastructural growth and development advancement in trible areas is a dire need which needs an immediate attention. Most of tribal areas in our country are with plenty of natural resources those are to be harvested for the growth at *in-situ* level. The variety of technological options are available that has to retrofit so as to build up sustainable growth in tribal areas. The value addition through the efficient and easy processes for the forest product, byproduct and the produce at farm level is possible by making them affordable. Constrain in deploying the value addition facilities in tribal areas are lack of information dissemination, ease of process and the financial. A non wood forest product (NWFPs) has great importance in managing forests sustainably in order to improve tribal rural economy. In affordable way an important concept in exploitation of NWFPs is adding value locally. Value addition of NWFPs has attracted attention because gathering and processing activities can be managed by the tribal people, with a greater portion of the end product revenue accruing to those who manage the forest resources. At tribal level processing may include grading, purifying, storing in congenial conditions to reduce post-harvest losses, and improving thereby the product quality to fetch higher price. NWFPs in India include medicinal plants, edible plants, starches, gums and mucilage, oils and fats, resins and oleo-resins, essential oils, spices, tannins, insecticides, natural dyes, bamboo and canes, fibers and flosses, grasses, tender leaves, etc., which have been traditionally used for livelihood, and social and cultural purposes. However, processing of NWFPs into value added products through simple technologies is limited. To exploit such resources robust processes are needed so as it will improve development of value added products.

Key-words: Tribal; processing, value addition, resources, NWFPs

Introduction

Employment and poverty are a multidimensional complex phenomenon. Apart from the macro economic problems, the degradation and restricted access of the tribal poor to the available material and environmental assets also fundamentally trap the poor in their circumstances. There is an urgent need to recast the forest–poverty nexus because forest ecosystems are capable of offering interesting opportunities and security nets for poverty alleviation through the *in-situ* and *off-situ* employment generation.

Realization of the great dependence of the tribal poor on forests is quite recent. Bringing poverty focus into forest management implies more deliberate efforts to link sustainable livelihood for poverty reduction with sustainable forestry. However, increased population pressure, continuing loss and degradation of forest resource, increased market demand or newly found needs make the situation difficult. NWFPs are goods of biological origin other than wood derived from forests. NWFPs are a group of under-exploited but potentially promising resource for sustainable livelihood of poor tribal people in rural areas. An important concept in understanding these prospects is sustainable exploitation of NWFPs and adding value locally. In India, most rural people use some forest products and many obtain part of their income from forest based activities.

Estimated employment opportunities to the tribal

Items	Employment (millions)
Collection of Tendu leaves	7.5
Tendu leaves processing	3.0
Lac processing	3.0
Sericulture	0.75
Bamboo based enterprises	0.55
Tassar silk cultivation	0.13

Ref. Jha & Jha, 1985, Arnold, 1995)

At the local level, NWFPs also provide raw materials for large scale industrial processing, including processing of internationally traded commodities such as

Honey gum Arabic	Rattan	Edible bamboo
Cork	Forest nuts	Mushrooms
Essential oils		
Perfumes	Cosmetics	Fiber extraction
Ropes making	Handicrafts	Paints and Polishes
Plants and animal parts for pharmaceutical products		

Many people living in and near forests are unaware of the potential of the resources for income generation because they lack access to information on processing possibilities. Processing of NWFPs adds value to them. Value addition of NWFPs has attracted international attention because gathering and processing activities can be managed by the tribal people, with a great portion of the end product revenue accruing to those who manage the forest resources. Market oriented production often goes through several levels of processing. The higher the level of processing carried out near the source, more of the product value can be retained locally. This offers the prospect for improving local employment, income and livelihood. At the national level this can also support production of consumer goods from NWFPs (e.g. perfumes, cosmetics, fiber extraction, ropes, handicrafts, etc.) and help increased foreign exchange earnings (FAO 1995). Amongst the value added processing activities in order to reduce post-harvest losses through grading, purifying, storing in congenial environment, to reduce the weight and volume of raw products, to increase their standardization and guarantee consistent quality and acceptability in multiple markets (Clay 1995) have more significance. NWFPs based industries are generally less polluting, less destructive of environment and amenable for vertical and horizontal integration (FAO 1995).

Situation of value addition of NWFPs in India

The following facts regarding contribution of NWFPs to India reveal their importance (Shiva, 1998):

1. Nearly five hundred million people living in and around forests in India depend on NWFPs for their sustenance and supplemental income (Tewari, 1994)
2. Studies in Orissa, Madhya Pradesh, Himachal Pradesh and Bihar indicate that over 80% of forest dwellers depend entirely on NWFPs, 17% landless depend on daily wage labour, mainly on collection of NWFPs and 39% people are involved in NWFPs collection as a subsidiary occupation (Negi, 1993)

3. It has been estimated that many village communities derive as much as 17-35% of their annual household income from sale of the NWFPs (Tewari,1994)
4. NWFPs provide 50% of the income to about 30% rural people (Gupta & Guleria, 1982)
5. After processing of NWFPs, value added products are obtained which increase the employment opportunities and income of the people e.g, forest-based small scale enterprises, many of them based on NWFPs provide upto 50% of income for 20 to 30 times of the rural labour force in India (Campbell, 1993)
6. An estimate made in West Bengal indicated that an average return of Rs 2720 ha/year is obtained from NWFPs which is 25% more than the pole wood harvest which fetches Rs. 16,000 per hectare after 10 years (Malhotra et al.,)
7. Over 50% of the revenues earned by the forest Department comes from NWFPs. Growth of revenues from NWFPs have generally been 40% higher than timber e.g., compound growth rates in revenues from NWFPs and timber during 1968-69 to 1976-77 period were respectively 15.1% and 10.8%, the former being 40% higher than the later one (Gupta Guleria, 1982).
8. It has been found that the share of export earnings from NWFPs has been ranging from 56.5% to 75% out of the total exports of forest produce including both the timber and NWFPs during 1959-91 (Gupta & Guleria,1982).

Resources to harvest from forest :

In the first category, activities like NWFP collection, rope making, honey collection, nursery etc can be considered whereas, in the later category schemes like mushroom cultivation, shop keeping, grocery etc. can be envisaged (Sharma 1997). NWFPs with their attendant instrumentalities play a meaningful role in bringing sustainability to the system because the employment generation from these enterprises is around 20 million man days per year, which is approximately half of the forestry sector. NWFPs related activities take care of both the unemployed as well as underemployed and NWFPs based small scale enterprises can further strengthen the linkage of the socio-economic base on account of :

- Low capital and low energy requirements.
- Proper utilization of local renewable resource and technological know-how.
- Checking migration from rural to urban areas and
- Being a family activity it provides satisfaction of "creation".

Food from forest

Natural forests are reservoirs of fruits, rhizomes, roots and leaves which are very rich in carbohydrates, proteins, starch and minerals. The tribal population living in the forests utilizes these as food supplements. At present these valuable resources are either under utilized or over utilized whereas, they have potential to provide sustained income to the forest dwellers. **TFRI** has initiated work on standardization of technologies for the extraction of starch and carbohydrates that can be further utilized for making neutraceuticals. Work on standardization of technologies for extraction of starch and carbohydrates from plants like *Curcuma angustifolia* and *Curculigo orchioides* is currently in progress.

New raw material for incense

Over exploitation of the bark of *Litsea* and *Machilus* has brought these two tree species to threatened status. A cheaper substitute for these two species has been found in *Hyptes suaveolens,* a weed growing in the forest of central India. Technology for making incense sticks utilizing mucilage from seeds of this species has been standardized.

Conservation and cultivation of medicinal plants

India is included among the 12 mega-biodiversity nations. Nearly 15000 plant species are being used as medicine, from this diverse flora. Medicinal plants are living and irreparable resource, which is exhaustible if over used and sustainable if used with care and wisdom. Importance of medicinal plants has been overlooked in the past. However, at present medicinal plants are looked upon not only as a source of affordable health care but also as a source of income. According to WHO report, over 80 per cent of the world population relies on traditional medicine largely plant-based for their primary healthcare needs. The position can not be sustained further because, on one hand, forest cover is steadily shrinking and on the other, the requirement of medicinal plants and herbs is increasing steeply. In order to conserve the gene pool of medicinal plant reserves and standardize their cultivation techniques, *ex-situ* conservation is very much needed. Cultivation and propagation techniques of rare, endangered and commercially important species like *Chlorophytum borivillianum* (safed musli), *Curcuma caesia* (kali haldi), *Acorus calamus* (bach), *Gloriosa superba* (kalihari), *Crataeva magna* (varun), *Strychnos potatorum* (nirmali), *Abelmoschus moschatus* (muskdana), *Asperagus recemosus* (satawar), *Plumbago zeylanica* (chitrak), etc. have been standardised. Classification of NWFPs has been done by various authors in different manners one such classification is given in table 1

Table 1 : Classification of non wood forest products (NWFPs)

SN	Items	Products
1	Food products	**Plant food products;** stem shoots, tubers, roots, leaves, flowers, fruits, nuts, condiments and epics, oil seed, mushrooms etc **Animal food products:** honey, bush meat, fish, shells edible, birds, eggs, insects etc.
2	Medicinal and cosmetic plants products	Drugs, poison, insecticides
3	Extractives products	Gums, resins, oleoresins, latex, tans and dyes, oils and fats, essential oil etc.
4	Animals and animals product other than food	Sericulture, live animals, lac, bones, fats, hairs, skin etc.
5	Fibers and flosses products	Bamboo, canes, rattans, leaf and stem fibers, grasses etc
6	Miscellaneous products	*Tendu* leaves and several others products have yet to be given commercial importance

NWFPs value additions :

Value addition to NWFP is any step taken to increase the value of a raw NWFP product at any stage between production and sales of the final product (Pethiya and Teki 2003). In other words NWFP value addition can be defined as any effort/strive committee by a forest dwellers enhance the longevity and value of an NWFP. Based on various field surveys, the value addition done by the villagers can be described in the following ways. Value addition can be done at various levels in variety of ways, which can further classify into a) simple (human base) b) complex (technology base).

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- Many scale differences exist for assessing forest resources, from relatively simple tree inventories to very costly and complex biodiversity assessments which may discourage forest resource managers from including NWFPs in their forest management plans. Time, money and the trained personnel to carry out NWFPs assessments are limited.
- Many scientific disciplines, development agencies and conservation organizations include NWFPs (or NWFP-related issues) in their applied research, development or conservation agendas, often with little coordination.
- There is a broad range of different cultural perceptions governing the use of NWFPs around the world, particularly for their use as foods (eating insects, for example).

Priorities for developing the non-wood forest product sector

Priorities for the development of NWFPs production are grouped into four clusters:

1. Improve the technology for managing NWFPs resources : Low-cost technology solutions for inventorying resources, developing sustainable harvesting techniques, defining harvest levels, and modifying silvicultural regimes to simultaneously obtain timber, forest services and NWFPs need to be devised. Most NWFPs are still harvested from natural systems, so *in situ* sources still dominate NWFPs supplies. Existing silvicultural treatments in forests still emphasize timber production, and little attention has thus far been given to the silvicultural needs of NWFPs species.

2. Better integrate *ex-situ* and *in-situ* production of NWFPs : How, where and when domestication becomes appropriate as a complementary or substitute strategy for producing NWFPs is a thorny issue. Another is whether domestication, if and when it occurs, will improve the livelihoods of forest dwellers. Producing NWFPs through agriculture (*ex-situ* or on-farm production) is a growing solution being driven by market demand, but gatherers are not necessarily the beneficiaries. While domestication may be a valid response to supply shortages, substantial research is still needed to solve the technical issues in both domesticating NWFPs species and in identifying the circumstances under which domestication programmes can lead to successful outcomes for forest dwellers.

3. Improve social equity in producing, using and trading NWFPs in a 'globalizing' world : How can forest management become more socially equitable, particularly for the rural communities that depend more on the non-wood resources of the forests? Other challenges are how to reconcile the objectives of different forest-user groups of timber and non wood resources, how to manage user conflicts and how to have the intellectual property or other rights of NWFPs producers adequately recognized and compensated by global trade. For instance, the shift from subsistence use to global commerce for some NWFPs is built directly on indigenous knowledge of these products and their longstanding traditional use. Local communities must benefit from their often very active role in conserving forest resources and from any contributions they make to the development of commercially interesting products. What is the impact of growing trade globalization on NWFP producers? How can entrepreneurship and the development of small enterprises be encouraged in forest communities still operating within village or local-market contexts? The roles and impact of non-tariff, trade-related instruments such as certification schemes and best practice codes needs further clarification. The methods currently in place to assess the socioeconomic importance of the NWFP sector at international, national and local levels must be improved in order to address the issues mentioned above.

4. Strengthen institutional support for the NWFP sector : Although informal arrangements to harvest, use and trade NWFPs may in some cases be well established, in general there are few formal institutional arrangements in place to monitor and regulate the flow of NWFPs from producers to consumers. Formal institutional arrangements based on coordinated multi-agency approaches are needed to address the management and conservation of NWFPs. This is because in many countries forestry, agriculture, environment and/or health ministries deal with different aspects of NWFPs. For example, socioeconomic issues of NWFPs production might be covered by ministries or agencies ranging from trade, industry, education, or research. Ministries that are concerned with social issues, such as regulating access to forests, may also deal with land reform or rural development issues, and include NWFPs. This fragmentation of competencies can result in poor management owing to poor communication and poorly coordinated action. Thus, communication among institutions within countries, and synergies among international partners, must be substantially improved. Policies generated outside forestry sectors may be as important as NWFPs policy within the forestry sectors, and these must be included in the development of institutional arrangements governing NWFPs.

5. Agriculture in forest: The triable are associated with small incremental production of agriculture through their traditional recourses. Mainly they are producing ragi, millet, paddy, foxtail millet etc. They still use their old technology to make the farm produce edible and marketable, which leads to maximum losses. It is a dire need to develop the network through which the appropriate and affordable technology can spread among the triable to convert their agricultural production in to consumable and marketable form. The technology of primary processing will boost the triable economy to greater extent. Small paddy processing machineries like micro rice mill, cleaner–cum rubber roll sheller, mini rice mill with by-products utilization techniques through rice husk fire stove are advocated.

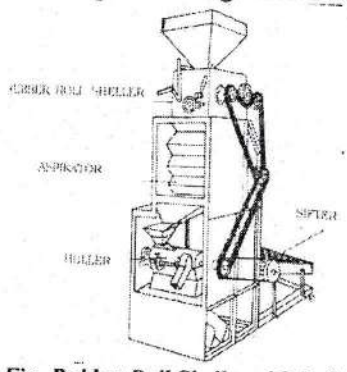

Fig.-Rubber Roll Sheller with huller as polisher

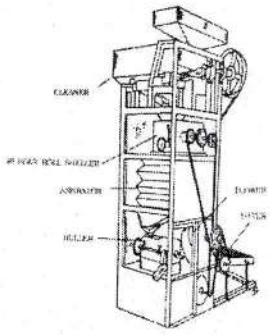

Fig.-Cleaner-Rubber Roll Sheller-Huller system

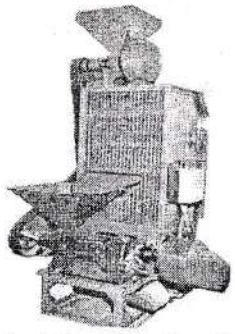

Fig.-Centrifugal Sheller- Huller Mill:-

Fig Demonstration of CRRI sigri at Sindapuri, Distt Bhandara

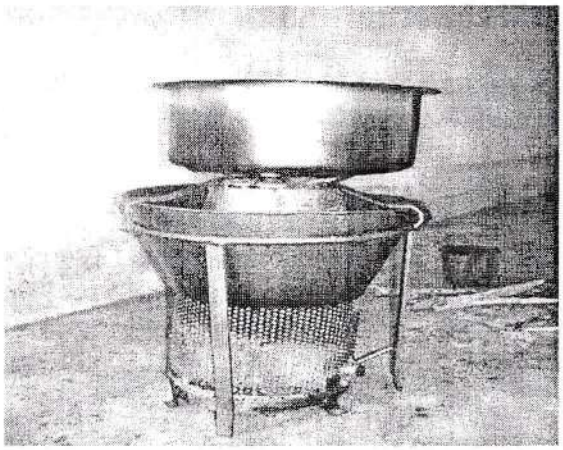


Fig CRRI sigri in operation


Fig Demonstration of CRRI sigri at Gorwa, Distt Akola using soybean residue

Benefits of CRRI Rice husk stove

- there is a saving in time and fuel
- less smoke in kitchen
- ease in operation and
- portability of the stove as an added advantage

PUBLIC PRIVATE PARTNERSHIP (PPP)

Many forest agencies has initiated many schemes to ensure active participation of local people, NGOs and industrial houses for the sustainable livelihood of the poor through integrated ecosystem approach including reclamation of degraded forests. The economic implications of tangible goods of the forest ecosystem are proposed to be enhanced through high quality inputs in form of cash as well as kind, non destructive harvesting, value addition, processing and marketing and equitable benefit sharing, in partnership with the dependent people, entrepreneurs and other interested organizations.

CONCLUSION

The scatter nature of resources in the tribal forest system now a day has great importance in main stream of economy. The resources available are to be harvested efficiently by adopting affordable processes for value addition, which will boost economy of tribal people.

Protection of Natural Resources in Tribal Farming

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The tribal population in India is 84.51 million, which constitutes 8.14% of tribal population. These tribal people reside in approximately 15 percent of the country's area. There are about 449 tribes and sub tribes in different parts of India. Half of India's tribal people live in the forests and forest fringes and their economy is linked with the forests.

More than half of the Indian tribal population is concentrated in Madhya Pradesh, Chhattisgarh, Maharashtra, Orissa, Jharkhand and Gujarat. The Negritos or the brachycephalic men from Africa presently survive in their original home-ground in the Andaman and Nicobar Islands. Some hill tribes like Irulas, Kodars, Paniyans and Kurumbas are found only in patches among the hills of south India. Mongoloid tribal groups are located in the North-eastern portion of India.

Tamilnadu has 6,51,321 tribal population, which constitutes 1.02% of the total population of the country. There are 36 tribes and sub tribes in Tamil Nadu. Out of the 36 Scheduled Tribe communities in the state, 6 Tribal Communities (ie) Toda, Kota, Kurumbas, Irulur, Paniyan and Kattunayakan have been identified as Primitive Tribal. Malayali are the largest Tamil speaking Scheduled Tribes constituting 47.6 per cent of the states Scheduled Tribes population followed by Irular, (23.9 per cent), Kattunayakan (6.9 per cent), Kurumans (3.8 per cent) and Kondareddis (3 per cent). Literacy rate of the tribal population is **27.9** per cent. Most of the tribals in Tamil Nadu are cultivators, agriculture labourers or dependent on forests for their livelihood.

The tribal groups in Tamil Nadu are distributed in almost all the districts and they have contributed significantly in the management of the forests. The Nilgiris district in Tamil Nadu is home for the six Primitive Tribal Groups viz., Toda, Kota, Kurumba, Irula, Paniyan and Kattunaicken tribes. The Toda women are deft in embroidery work. The Kotas live in seven settlements, generally known as Kotagiri or Kokkal. They are village artisans who are good in carpentry, black smithy and pottery. The Kurumba people are experts in basketry and other related bamboo works. The traditional occupation of the Kurumbas is gathering food, collection of honey and forest produce. They are good at herbal medicine and traditional healing. Now, they are mainly engaged in agriculture and those who do not own lands work as casual agricultural laborers. The other three groups – Irulas, Paniyans and Kattunaicken are not known for traditional handicrafts. They are generally food/forest produce gatherers, now working as casual agricultural/estate labourers.

The tribal communities live inside the Reserved Forests, in the vicinity in fringes and outside and are also called 'forest dwellers'. Their socio-cultural life is centered on nature. Degradation of forests have reduced the resource availability and the employment opportunities for tribals and has also affected the food availability, livelihood options and the quality of life of the tribals. In the State of Tamil Nadu, the Forest Department has taken many initiatives through programs like ITDP, HADP, WGDP, TAP for tribal development and has been, a Department closely associated in tribal welfare activities. Tamil Nadu Agricultural University is also operating many programmes to conserve the forest resources as well as improve the revenue status in tribal areas

1. CULTIVATION METHODS FOLLOWED IN TRIBAL AREAS

a. Shifting Cultivation

"Shifting cultivation" is an ancient form of agriculture practiced by about 500 million people around the world even today. It is also known as "swidden agriculture", slash and burn or simply "jhum". The two key components of slash and burn agriculture are the use of fire to prepare fields for cultivation and the subsequent abandonment of those fields as productivity declines. The inevitable decline in productivity is a result of the depletion of soil nutrients and also a result of the invasion of weed and pest species. Once abandoned however, fields are allowed to return to a more natural state as native plant and tree species reclaim the field to pre-disturbance levels that mimic more closely natural distribution regimes. These fields are used as a source of fruits, nuts, fibers, medicinal plants, and game. Once ecosystem recovery is sufficiently advanced, the field may be used again through shifting cultivation (Joseph and Michelle, 2007).

In contrast, modern mechanized agriculture often results in large areas planted in a monocrop and requires the removal of almost all trees in order to use farm machinery.

b. Settled Agriculture

Agriculture in the tribal villages/area is predominantly rain fed and mono-cropped. Broadly, tribal livelihood system can be classified into three types. First forest dependent **upland systems** are usually located in upper catchments areas. Second, mixed systems which are usually located in the **middle, watersheds** and these are partially hilly areas, where communities depend less on forest and place added reliance on agriculture. Farming is mainly single crop with some paddy and vegetable cultivation. Food security extends to three to four months. Third lowland systems are located in **lower watershed.** These communities extend into the lower plains and may have relatively little forest access. They tend to be more multiethnic, more intensively farmed land holdings and own more cattle. Double cropping is more common, and if there is supplementary irrigation, even a third crop may be grown. There is a greater reliance on paddy, vegetables are cultivated nearly year round and overall food security can extend from five to seven months. Year round access to most communities allows for greater market orientation. Many fields are already bunded as the terrain is generally flatter and there is better system. Farming has a longer history, which is reflected in greater productivity per hectare. Distant migration may be less prevalent but local wage-earning opportunities are more available.

Women play an important role in (i) food gathering from the forest; (ii) rope making from the bark of trees & sabai grass; (iii) honey collection; (iv) herbal medicinal plant collection, processing & sale; (v) hunting & trapping, 3 (vi) basket making; (vii) shifting cultivation; (viii) labour; and (ix) fishing. The tribes are involved in market economy through a large number of weekly and by-weekly rural markets for Non Timber Forest Produce (NTFP).

2. PROBLEMS CAUSED TO NATURAL RESOURCES

a. Shifting cultivation

Many critics point out that when done *improperly*, shifting agriculture can quickly degrade large areas leading to rapid loss of forest cover. The problem in most places throughout the tropics however is that new settlers often lack several key resources and skills needed to successfully and sustainable use slash and burn agriculture.

These include:

- lack of detailed knowledge of local soils, climate, and ecosystems,
- lack of agricultural knowledge and skills
- lack of credit and technical support, and
- poor integration with local and regional economies.

Most of the times, new settlers enter an area, clear the forest, cultivate crops for a short period of time. Due to low production levels settlers sell their land to larger land owners and move on to another location and once again start cutting and burning in new forest lands.

The shifting cultivation is considered devastative and dis-advantageous as it not only causes harm to the eco system but also exerts negative impact on economy (Balaram, 2006). Some of the evil effects of such cultivation are:

i) makes the springs to dry up.
ii) results in soil erosion
iii) destroys valuable timber
iv) responsible for causing very heavy floods, and
v) silting of the tanks and fields and damage to crops
vi) loss of biodiversity

b. Settled agriculture

In the settled agrarian areas of tribal farming the problems related to deterioration of natural resources are: (1) decline in soil fertility, (2) soil erosion, (3) poor development of water resources, and (4) poor yield of crops.

In the rainfed areas land degradation and depletion of biomass, biodiversity and groundwater levels leave the functioning of ecosystems and the subsistence of local livelihoods in severe distress. Where supported by appropriate measures of soil and moisture conservation, rest, restraint and regeneration, there is a marked improvement in recharge of groundwater levels, biomass productivity and biodiversity, resulting in increased crop productivity, double cropping, fodder and water availability.

3. PROTECTION OF NATURAL RESOURCES

In the view of natural resource protection the tribal farming can be divided in to two distinct categories: (1) areas where shifting cultivation is practiced and (2) areas where settled agrarian activities are in practice.

1. Streamlining Shifting Agriculture

Prevention and control of shifting cultivation occupied center stage of forest management for many years. Abolishing the age-old practice, however, is almost impossible without arousing a very strong resistance among the people. The practice is particularly rampant among the most primitive tribes, inhabited in the remotest areas. Remoteness thus, emerges as one of the important factors explaining very high proportion of degraded forest (Amita et. al., 2005). While there may be constraints in enhancing connectivity to the region due to conservation objectives, nevertheless it is crucial to fill-in the 'Governance-Gap', which is fairly large. Shifting cultivators may be trained in alley cropping (Kung et. al, 1986).

In June 1987 Government of India, Ministry of Agriculture floated a pilot scheme for control of shifting cultivation. It has two fold objectives i.e. restoring ecological balance in the hill areas and improving socio-economic conditions of tribal podu practicing families by weaning them away from podu cultivation with 100% Central Assistance. Keeping in view the recommendations of ICAR as well as World Bank in the proposed model, the following strategies have been included:

(a) To promote forestry on upper reaches with silvipasture development.
(b) To break middle slope length for annual or perennial fruit trees and inter-crop.
(c) The lower slopes will be put under agricultural crops.

The tribal farmers need to be sensitized about the soil and biodiversity losses in their ecosystem. The possibility of using a portion of the slashed material for mulching may also be explored. They may also be trained to re-seed the swidden with local natural vegetation towards the end of the land occupation for cultivation. This will help in quickly establishing the natural vegetation. Biodiversity losses can be minimized by keeping the swidden as small as possible.

Rational land use on watershed basis may be taken up:
(a) Providing land to the tribals who are willing to give up cultivation on steep slopes.
(b) Plantation of economic species useful for tribal community.
(c) Introduction of conservation farming to allow tribal people to obtain higher production from crop land.
(d) Utilization of steep slopes for production of timber.

2. Soil and water conservation

It is widely accepted fact that the tribal agriculture, supported by Soil and Water Conservation measures can enhance production and productivity of agriculture while at the same time very beneficial for the environment. ***Micro-minor irrigation schemes*** are most relevant for the tribal areas, considering undulated topography and the nature of small holder agriculture.

- Innovative small-scale water control interventions can act as a trigger to revitalize tribal livelihoods.
- Lifting devices such as low-cost and high-efficiency diesel pumps as well as manually operated treadle pumps need to be encouraged and supported in tribal area.
- Community based irrigation management, community action based on traditional wisdom are critical elements of successful initiatives in tribal areas
- Agri-horti-forestry is effective for tribal farmers.

Farm ponds cater to the critical irrigation requirements, improve the moisture regime of the fields along the slope, and help take up an additional crop of redgram on the bunds contributing to the otherwise low household incomes. Innovative approaches such as Systems of Rice Intensification (SRI) are also gaining acceptance as there is a marked increase in production as compared to the conventional methods of cultivation.

3. Agri-horti-forestry

In Agri-horti-forestry multipurpose tree species, cash crops, medicinal & aromatic herbs can be grown. Agro-forestry is also required for judicious & scientific use of land & water resource along with development of waste lands. Integration of all resources available to farmers can generate more employment opportunities and income in rainfed farming situations.

Agro-forestry in integration with other income generating components like fisheries, piggery, duckery, goatery, poultry, etc is found to be a viable system for small holdings. Researches show that the return per rupee investment is four times in Fish-cum-pig and five times in case of Fish-cum-duck farming system. Further, the inclusion of agroforestry trees, horticulture, fodder, etc ensures sustainability of the system.

4. Measures to boost eco-restoration

- Common lands, forestlands and grazing lands are to be brought under collective management by community institutions (FES, 2009).
- Soil and moisture conservation and revegetation measures are to be undertaken.
- Revenue wastelands may be leased to community institutions.
- Jungle lands and forestland near the tribal villages may be brought under Joint Forest Management.
- Biodiversity may be assessed and appropriate conservation action plans may be prepared and implemented.
- Restoration plans should aim at enhancing the presence of natural pest controllers, pollinators, seed dispersers, etc. that play a critical role in fortifying the production systems.
- Soil and moisture conservation measures may involve groups of para workers who hail from the tribal villages.

5. Institutional interventions

The National Rural Employment Guarantee Scheme (NREGS) commits the government to providing 60 million rural households in 200 selected poor rural households in 200 selected poor rural districts with jobs on the local infrastructure projects. Developing new rural infrastructure prompt adoption of innovative green revolution technologies adapted to rainfed agriculture such as expanded agricultural credit, and agricultural research and extension. These recent developments raise prospects for unfavorable agricultural areas (Christopher et. al, 2006).

Increased investments in rainwater management, diversification of cropping/farming systems, soil health management, mechanization by custom hiring, more energy inputs etc. are important to improve productivity especially for producing marketable surplus by subsistence producers. This will reduce the pressure on land and help protect natural resources in the ecosystem.

The implementation of Forest Rights Act, 2006 has opened up avenues for convergence in livelihood opportunities for the tribal and forest dwellers. Animal husbandry becomes important pathway of improved livelihoods in the forest fringe areas.

6. Information and Communication Technology

Rainfed versus irrigated or rural versus urban divide can be leveled off with unlimited potential of the digital and multimedia information technology. Mobiles, handheld computing gadgets, E-Mail, E-Chaupal, forecasting of weather, prices and disease have been able to improve information among the farmers, other primary producers, extension workers, input suppliers, market agents, etc. This technology can be made available to the tribal farmers.

4. TRIBAL DEVELOPMENT PROGRAMMES IN TNAU, Coimbatore

1. Department of Millets, TNAU

Department of Millets of Tamil Nadu Agricultural University is involved with survey and developmental activities in Tribal areas of Tamil Nadu. TNAU has identified nearly 54 traditional cultivars in the tribal communities of Tamil Nadu (Table 1). The tribal prefer to continue the cultivation of their own traditional cultivars as these crops are ecologically suitable, drought resistant, pest tolerant and disease resistant.

Table 1: Traditional cultivars used by the Irula, Malayali, and Muthuvan tribes in Tamil Nadu

Local name or description of the cultivars	Botanical name
Paddy 1. Modumulingi, Perunellu, Dhonanellu or Mottanellu 2. Kottanellu 3. Manavari	*Oryza sativa*
Minor Millets; Samai (Little Millet) 4. Vellasama 5. Kothusamai or Pillusamai 6. Karunsamai 7. Odusamai	*Panicum sumatrense*
Ragi (Finger Millet) 8. Vellasurattai 9. Karunsurattai 10 Vellari 11. Thooval Kevuru 12. Periya ragi 13. Sendu ragi	*Eleusine coracana*
Varagu 14. Thiri varagu 15. Pani varagu 16. Varagu	*Paspalam Scrobiculatum*
Thinai (Foxtail Millet) 17. Karunthinai 18. Vellanthinai 19. Korai	*Setaria italica*
Kambu (Millet) 20. Malakambu or Pottukambu 21. Kattukambu	*Pennisetum glaucum*
Makkasolam 22. Mokkasolam 23. Silippisolam 24. Pottusolam	*Zea mays*

Pulses 25. Kollu 26. Avarai 27. Pandhal avarai 28. Mochai 29. Karuppu avarai 30. Vellai avarai 31. Oor avarai 32. Thuvarai 33. Ulundu 34. Thatta payiru	*Dolichos purpureus* *Phaseolus* spp. *Vigna* spp.
Culinary 35. Molagai 36. Yellu	*Capsicum annum* *Sesamum indicum.*
Vegetables 37. Poosani 38. Parangi 39. Suraikkai 40. Kothavaranga	*Cucurbita* spp. *Cucurbita* sp. *Lagenari* spp. *Dolichos* spp.
Thinai (or) Pandi 41. Uppan thinai 42. Sen thinai 43. Arapandi	*Setari italic*
Thatta Payiru 44. Kuthukaramani 45. Kodithattapayiru	*Vigna sinensis*
Keerai 46. Pink variety 47. Dark brown variety 48. Pale brown variety 49. Green variety 50. Vella keerai 51. Karungkeerai 52. Padukukeerai 53. Mullukeerai 54. Silukeerai	*Amaranthus* spp.

From 2003 onwards about 938 trials *viz.,* Adaptive research trials, On farm trials, Front Line Demonstrations and Mini kit Trials in finger millet, little, kodo, barnyard, foxtail and proso millets at tribal farms of Kolli, Servarayan, Kalrayan, Javadhu, Yelagiri, Vellimalai, Chinnamalai, Pachamalai, Anamalai, Anakatti, Bargur, Kadambu, Thalawadi, Thalamalai and Valparai hill ranges in Salem, Namakkal, Thiruvannamalai, Vellore, Villupuram, Dindigul, Erode, Tirupur and Coimbatore districts were conducted by Department of Millets, TNAU, Coimbatore. Here, the benefits of high yielding varieties, advanced cultures, improved

cultivation practices and post harvest technologies were demonstrated. Tribal farmers gained adequate knowledge of these components, adopted the advanced technologies and obtained higher monitory returns.

During every cropping season, a pre-sowing training was given to the tribal farmers for each millet crop separately. In the middle of the growing season a farmers' meeting was held for mid-term correction and clarification of their queries. At the time of harvest field days are conducted along with an exhibition. Farmers' Participatory evaluation trials were also conducted to validate the desire of the farmers (Table- 2).

Recognizing the impact of these efforts a scheme entitled "Popularization of Small millets in Hilly Tribal Areas and Small Farms in Tamil Nadu" was funded (Rs. 10 lakh) by Sir Ratan Tata Trust, Mumbai and it is being operated successfully by the Department of Millets from 2008. Under this scheme the precision farming of finger millet at Bargur hills in Erode district, little millet in Javvadhu hills in Vellore district and kodo millet at Thittakkudi in Cuddalore district was being demonstrated. Hands on training for value addition of these small millets was also given to the Self Help Group farm women. Market linkage is being effected with Departmental stores and Organic product outlets. By these efforts, the grain yield has increased to the tune of Rs. 7,500 to 11,250. The quality of grain and fodder has also been improved fetching a good price and added market value.

In addition, farmers' Food courts are being operated with high turn over and high success in the *Uzhavarsanthai* during evening hours as in Namakkal and Thiruchenkodu. This kind of efforts have improved the utilization of millets and revived the millet cultivation.

2. Horticultural Research Station, Ooty

Horticultural Research Station was established in Nilgiris in 1988 . Since then this centre has been involved in village tribal development programmes with the vision of converting entire farming in Nilgiris to a Sustainable Farming Systems. This integrated programme for sustainable farming and sustainable livelihoods has already been successfully established among the tribal communities.

Nilgiris is a part of the Western Ghats which accommodates various ethnic groups like Thodas, Kotas, Kurumbas, Irulas, Paniyas and Katu nayakas. The Nilgiris is endowed with cultivation of tea, coffee, vegetables ,medicinal and aromatic plants, spices and many fruit crops, which contribute mainly for the economy of this district.

Recently, in collaboration with the Hill Area Development Programme (HADP), an Ethnographic Garden is being established to highlight the ethnobotanical wealth of the tribals of Nilgiris. This garden serves as a model showcasing the livelihood and farming practices adopted by the tribals. The food grain, wild fruits, fodder and medicinal plants that are used by the tribals are being explored and nearly 1000 such plant species are being assembled in the garden. The habitats of Thoda, Kota, Paniya, Irula, Kurumba and Badaga tribal communities in the different agro climatic zones of Nilgiris for native plant wealth are being surveyed and a gene pool of the endangered plant species (medicinal traditional grains, vegetables and fruits) is being maintained. A vegetable and medicinal plant nursery for conservation and multiplication, a model orchard with native and wild fruit trees and a fodder unit to maintain the cattle population is being established in the ethnographic garden. This centre is also documenting information on Ethno-botanical uses of the tribal plant wealth. An exhibition cum training centre for showcasing the tribal plant wealth is also being established within the garden.

Table 2: Farmers' Participatory evaluation trials were also conducted to validate the desire of the farmers

S. No.	Name of the scheme/ programme	Crop	Variety / advanced cultures	No. of trials	Place	District	Trainings	Field days with exhibition
1.	SRTT- "Popularization of Small millets in Hilly tribal areas and small farms in Tamil Nadu" (2008-2010)	Ragi *Eleusine coracana*	CO (Ra) 14, TNAU 1005	175	Thalawadi, Bargur	Erode	3	3
		Samai *Panicum sarmenntosum*	CO (Samai) 4	95	Javvadhu Hills	Vellore, Thiruvannamali	3	3
		Varagu *Paspalum scrobiculatum*	CO3, TNAU 51	36	Adari, Thittakudi	Cuddalore	2	2
2.	All India Coordinated Small Millets Improvement Project (2003-2010)	Ragi *Eleusine coracana*	CO (Ra) 14	24	Vaalparai Kaaramadai	Coimbatore	-	-
3.	FLD on Integrated cereals development programme on coarse cereals based cropping system (2003-2010)	Ragi *Eleusine coracana*	CO13,CO (Ra) 14	65	Thalawadi, Bargur	Erode	-	6
		Samai *Panicum sarmenntosum*		53	Javvadhu Hills	Vellore, Thiruvannamali		
		Varagu *Paspalum scrobiculatum*	CO3,CO(Samai) 4 CO 3	58	Adari, Thittakudi	Cuddalore		

4.	Adaptive Research Trials (2003-2010)	Ragi *Eleusine coracana*	TNAU 946, TNAU 1005, TNAU 1008, TNAU 1018 TNAU 51	230	Kalrayan Hills, Seervarayan Hills, Kolli Hills, Vellimalai, Anaali	Salem, Namakkal, Villupuram, Coimbatore	-	-
		Varagu *Paspalum scrobiculatum*		60	Adari, Thittakudi	Cuddalore		
5.	On Farm Trials (2003-2010)	Ragi *Eleusine coracana*	TNAU 946, TNAU 1005, TNAU 1008, TNAU 1018	48	Kalrayan Hills, Seervarayan Hills, Kolli Hills, Vellimalai, Anamali	Salem, Namakkal, Villupuram, Coimbatore	2	2
		Varagu *Paspalum scrobiculatum*	TNAU 51	65	Adari, Thittakudi	Cuddalore		
6.	Farmers' Participatory Evaluation trials (2007-2010)	Tenai Steria italica	TNAU 196 TNAU 143	5	Kolli Hills	Salem	1	1
		Panivaragu Panicum miliaceaum		5	Yelagiri	Vellore		

7.	NADP "Dryland development and maxi-mizing crop productivity (Minor millets)" (Phase 1) (2007-2008)	Ragi *Eleusine coracana*	CO (Ra) 14	4	Vellodu	Erode	8	1
		Kudiraivali	CO 1	2	Thirumangalam	Madurai		
		Varagu *Paspalum scrobiculatum*	CO 3	2	Nallur	Cuddalore		
8.	NADP "Dryland development and maximizing crop productivity (Minor millets)" (Phase 2) (2008-2009)	Ragi *Eleusine coracana*	CO (Ra) 14	2	Senthamangalam	Namakkal	8	-
		Kudiraivali Echinochloacolona	CO 1	2	Paramakudi	Ramnad		
		Varagu *Paspalum scrobiculatum*	CO 3	2	Arupukottai	Virudhunagar		
9.	BRNS "Development of non-lodging little millet (*Panicum sumatrense*) varieties with bold seeds and high yield through induced mutagenesis" (2009-2010)	Samai *Panicum sarmenntosum*	TNAU 256, TNAU 257, TNAU 258, TNAU 259, TNAU 260, TNAU 261, TNAU 262	5	Javvadhu Hills	Vellore, Thiruvannamali	-	-

The centre is also conducting various **Training programmes for tribal welfare** on i) Production technology for vegetables, fruits, cutflowers, medicinal and aromatic plants and mushroom and ii) High-tech training on post harvest processing and preservation. The unemployed tribal youth have been trained on production of biofertilizers, biocontrol agents, vermicompost and organic mushroom cultivation which has motivated the participants to start their own production units.

This centre has also established model organic micro-watershed with integrated organic farming system approach at two tribal villages. Providing trainings on Compost making, setting up low cost vermicompost pits, setting up low cost polytunnel facility, developing green hedges and maintaining practical support for the tribal people are the major objectives in the **Model tribal village project**.

The Horticultural Research Station in Ooty has put up tremendous efforts in supporting the livelihood and upliftment of the tribal community in this region by way of intensive farming research, training and extension activities.

c. NAIP on Wild Bees

TNAU is playing a crucial role in educating and sensitizing tribal honey hunters of Sathyamangalam reserve forests through the NAIP on Wild bees on sustainable honey harvest from wild rock bee colonies. The main focus of the project is to change their mind set of tribals from adopting destructive methods of honey collection to bee friendly methods which will avoid killing of wild bee colonies. Further processing and packaging facilities will also be extended to facilitate production of clear honey. Technology for Value addition of amla with forest honey will also extended. The project is carried out in six selected tribal villages.

Major interventions

1. A simple device used for coir rope making was suggested for making rope from the bark fibres collected from *Hardwickia binnata*. This will greatly help to reduce the time for rope preparation from four days to few hours.
2. To ensure maximum safety while climbing a rock cliff, a seat/chest harness with two carabiners and climbing rope were given to the climbers while using the traditional rope ladder.
3. Simple tools were designed and distributed for cutting, collecting and extracting honey from honey combs.
4. Harvesting honey unit alone leaving the brood comb was recommended to ensure sustainable honey harvest from wild bees.
5. Bee suit and bee veil were given to the hunters to protect them against bee sting while honey harvest.
6. A jumbo smoker was given in the place of smoke torch to eliminate the fire hazard and burning of bees.
7. Draining method was recommended in the place of squeezing for extracting honey from the harvested combs.
8. Plastic jerry cans and buckets were given for storing raw honey.
9. Honey processing facility was created at TNAU (100 kg per day) both for processing the raw honey and reducing the excess moisture.
10. Honey hunters are grouped into seven SHGs to get the total benefit of profit obtained through the sale of honey.

11. The women SHG's were started to take up the production of value added amla products with honey for which intensive training was imparted for a month.
12. A value addition lab was established for the production of value added products.
13. The local NGO (SUDAR) and state forest department were inducted as collaborators for the successful implementation of the project.
14. The honey collected will be branded as SHAKTHI honey and will be sold from TNAU shortly.
15. A tribal village has been selected and adopted for the TOT activities to help the tribals to improve their living conditions by adopting the latest location specific farm technologies developed at TNAU.

India is the second most populous and seventh largest country in the world with a forest and tree cover of 23.68% of its geographical area (State of Forest Report, 2003), which is still below the national goal of 33%. Forests remain the primary source of fodder, fuel wood, timber and non-wood forest products to the forest dwellers and village communities living in and around forest areas. To meet the ever growing need of increasing population there is least scope of horizontal expansion of forestry. The only option left is vertical expansion of natural resources over the available land area , for which conservation of natural resources is the only means.

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Tribal Development – A Perspective

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INTRODUCTION

The tribals are believed to be the earliest settlers in Indian peninsula and are generally called Adivasis, implying original inhabitants. In fact, the largest concentration of tribal people, anywhere in the world and except perhaps Africa is in India. A tribe is a homogenous and self–contained unit without any hierarchical discrimination. Each tribe enjoys equal status and has its own system of administration.

According to 2001 census, the population of Scheduled Tribes in the country was 8.43 crores, comprising about 8.2 per cent of total Indian population. The major identified scheduled tribes in country is approximately 533, though the total number of tribal communities is reported to be 642 and several of them have become extinct or merged with other communities, as the tendency for fusion and fission among tribal population is a continuous process. These 533 communities speaking 106 different languages have been so far notified as the Scheduled Tribes. They have their own socio-cultural and economic milieu. Geographically and culturally, the tribes are at widely different stages of social as well as economic development and their problems differ from area to area within their own groups.

The majority of tribal population are depending on agriculture (Podu /shifting cultivation) and allied activities like sheep and goat rearing, bee keeping, sericulture and collection of Non-timber forest products. The important crops gr own in the tribal and hilly areas are finger millet (ragi), little millet (same), dry paddy, niger, maize etc., Fruit crops like hill bananas and pinaaplles are are grown under rainfed conditions on the hill slopes. Custard apples and jack fruit are grown naturally on the hill slopes. In addition, along the hill slopes, turmeric and ginger are also cultivated in the tribal areas of the country.

The tribal areas is characterised by small land hodings, weak market infrastructure, meagre transport facilities, poor linkages between formal and informal sources and low levels of social and political articulation. Shifting cultivation, environmental degradation, particularly soil erosion, shortage of energy, water and financial resources, limited technical support, traditionalistic nature of people, inherited customs and traditions and unfavourable pricing systems are some of the problems in hill and tribal agriculture of the country.

The Constitution of India has made definite provisions for the welfare and upliftment of the tribal people throughout the country. The greatest challenge that the Government of India has been facing since independence is the proper provision of social justice to the scheduled tribe people, by ameliorating their socio-economic conditions. As most of the tribals dwell around within the forest they are practically deprived of many civic facilities and isolated from modern and civilized way of living.

CONSTRAINTS IN TRIBAL DEVELOPMENT

There are innumerable constraints responsible for lower pace of tribal development process than desired. Some of the major constraints are:

(i) **Destruction of forests:** The forests are not only the source of livelihood for tribals but there exists an intricate relationship between tribals and forests in forest Eco-systems. The depleting forest resources are threatening imminent food security for a good portion of the tribal population.

(ii) **Lack of awareness:** There exists lack of awareness among tribal population about various developmental programmes launched by Government of India and States, resulting in their exploitation.

(iii) **Protection of Tribal Rights & Concessions**: The Tribals have been given numerous rights and concessions under various statutes of central as well as State Governments but they remain deprived of the benefits arising out of such statutory provisions due to their ignorance and apathy of enforcing agencies.

Suggestions for improving the socio-economic status of tribal families are:

- The tribals are illiterate, usually self content, lack motivation and aspirations. Therefore there is a need to identify appropriate education methods in order to improve their motivation and aspiration levels, so that further developments become less difficult.
- Majority of tribals do not possess land ownership thereby they are less motivated to adopt modern agricultural practices. Tribals may be given land entitlements or provide cultivable lands on lease to enable farmers to take benefits extended by credit and other development institutions.
- The extension effort to educate the tribals is very negligible. A separate extension strategy should be developed to reach the tribal farmers and provide the community the required exposure to adopt new technologies. Desired results can be achieved mainly by improving the efficiency of the delivery system matching with tribal capabilities and interest.
- Encourage tribal farmers to adopt Integrated farming Systems to obtain sustained income throughout the year.
- The programs envisaged for tribal development should aim at judicious use of the available local resources on sustainable basis and preserve the natural eco-system as most of the tribal dominated areas are ecologically fragile and rich in biodiversity.
- While rehabilitating the tribal communities from reserved \ protected forest areas care may be taken to ensure and protect their livelihood securities and also provide alternate employment opportunities. The concerned government functionaries should also take adequate steps to educate the beneficiaries about the importance of relocation program, facilitate their moving away from protected forest area continuously and also improve their socio-economic status by all possible means.
- Progressive tribal youth may be identified and given specialised training in the selected areas
- Further, distance cum vocational education may be provided to the tribals in their dialects which ensure effective learning. The tribal research institutes can think on this line and the agencies / centres that have training facilities like KVKs, reputed NGOs may act as contact centres for this purpose in collaboration with the tribal welfare department.

- The role of the NGOs in tribal development, especially primitive tribal groups, should be appreciated. Hence, there needs to be a greater harmony between the Government and Non-Governmental Organisations in a public-private partnership mode for sustainable tribal development. The Panchayati Raj Institutions can also take a lead role in this aspect.
- The collection and exploitation of Non-Timber Forest Products (NTFPs) and medicinal plants are closely intertwined with life of tribals living either inside or on the periphery of the forests. To the vast majority of tibal people, extraction, processing and Marketing of NTFPs and Medicinal plants either source of employment through out the year. The lack of information among the NTFP collectors about the true worth of the products has resulted in exploitation by middle men and private traders. The cooperative agencies needs to be established in each state for extraction, processing and marketing of NTFPs and medicinal plants to ensure fair price to the produce for eliminating exploitation by the middlemen and petty traders.
- The officials of the forest Departments and cooperative agencies needs to educate tribals about utilisation of NTFPs, quality aspects, market demand and scientific and sustainable exploitation methods of NTFPs.
- NTFPs alone will not be able to meet the ever raising financial needs of tribals, alternative income generating activities, agriculture, horticulture, animal husbandry, vocational trainings, etc, should be promoted to reduce the future pressure on NTFPS and medicinal plants.
- It is necessary to evolve a comprehensive package that generates adequate income to enable tribal families to cross the poverty line.
- It is appropriate to introduce training component in all the tribal development programs for its effective implementation.
- The indigenous knowledge possessed by some of the tribal communities needs to be documented, validated with scientific information and preserved. for the use by the future generation. Steps to popularize Indigenous agriculture technologies among other farmers needs to be taken by the developmental Departments.
- Whenever such knowledge is exploited for commercial purpose, mechanism to share the benefits with tribal communities needs to be evolved.

Tribal Area Development in Gujarat

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Gujarat state is situated on the west coast of India and is bounded by the Arabian Sea in the West, by the States of Rajasthan in the North, Madhya Pradesh in the East, Maharashtra in the South and South East. The State has an international boundary and has a common border with the Pakistan at the north-western fringe. The two deserts, one north of Kachchh and the other between Kachchh and the mainland Gujarat are saline wastes. The State has a long coast-line of about 1600 kms. Gujarat State comprises of 25 districts, subdivided into 226 talukas, 18618 villages and 242 towns. Gujarat has geographical area of 1.96 lakh sq.kms. and accounts for 6.19% of the total area of the country. According to Census 2001, the population of Gujarat was 5.06 crore and the total number of households were 96.44 lakh. The decadal growth rate of 1991-2001 was 22.48%. The population density of Gujarat is 258 persons per sq.km. in 2001. Gujarat has a rural population of 62.33% and about 23.29 lakh families are living below poverty line in rural areas. The literacy rate in the State (excluding children in the age group 0-6 years) is 69.97% in 2001. Out of the total population in the state 203.7 lakh (42.10 %) were workers and 280.2 lakh (57.90 %) were non-workers and 26% are practicing cultivation.

Scheduled Tribe Population Scenario in Gujarat:

Scheduled Tribe (ST) population of 74.81 lakhs accounts for 14.76% of the total population in the State and occupies the 4th position in terms of the concentration of STs in the country (8.9%). In Gujarat State, the Tribal Area Sub-Plan (TASP) covers 43 Talukas, 15 Pockets including one MADA Pocket of Amod and 4 Clusters in 12 ITDPs. The coverage of tribal population under ITDPs is about 61.38 lakhs, which accounts for 82.04% of the total tribal population in the State, while 13.43 lakhs tribals are spread all over the State except Dangs District. Tribals predominantly reside in ten Districts having ITDP areas and Dangs district, which is entirely a tribal District. The total area covered under TASP is 31642 sq.km. Out of the total area of 196024 sq.km. of the State, constituting 16.14% of the total geographical area. In Gujarat State there are 29 Scheduled Tribes, out of which five most backward tribes are declared as primitive tribes viz. Kotwalias, Kathodis, Padhar, Siddis and Kolgha. The Bhil with 3.4 lakh population are the majority tribe followed by Dubla, Dhodia, Rathawa and Naikda. The tribals in the State mostly inhabit in the eastern border areas of the State that are characterized by hilly terrain, rocky soil, uncertain rainfall and presence of large forest areas. The STs of the State are predominantly rural (92%) and has a low literacy rate of 47% as that of national average of the STs in the country and the female literacy is only 36%. The sex ratio among STs of the State is 974 which is close to national average and better than SCs and general population of the State. Barely, 2.5% of the literate STs have educational attainment beyond graduation level.

About Scheduled Tribes:-

Scheduled Tribes (STs) are indigenous, have their own distinctive culture, geographically isolated and are low in socio-economic conditions. For centuries, the tribal groups have remained outside the realm of the general development process due to their habitation in forests and hilly tracts. After independence, Government of India has scheduled the tribal groups in the Constitution and provided special provisions for their welfare and development.

Social system and living condition of tribal areas:-

Lokur committee has defined Schedule tribes show primitive traits, distinctive culture, shyness of contact with public at large, geographical isolation and social economic backwardness. They posses pre-agrarian level of technology, stagnant or declining population and subsistence level of economy.

- Traditional social system.
- Traditional living in hut along with animals, and mostly scattered community living.
- Drinking of alcohol and smoking habits.
- Foods based on availability in nearby forest & self fields.
- Selection of Agricultural crops based on seasonal requirement of family and for this low value crops grown for self sufficiency of family without considering commercial farming.

Crops of Tribal area in Gujarat:-

- South Gujarat (Navsari, Surat, Valsad, Bharuch) Paddy, Sorghum, Nagli, Niter, black gram, pigeonpea, cotton.
- Middle Gujarat (Punchmahal, Vadodara, Kheda) Paddy, Sorghum, Maize, Bajra, Pulses
- North Gujarat (Banaskantha, Sabarkantha) Maize, Bajra, Caster, Mustard, Cumin, Pulses)
- Now tribal farmers grow more remunerative crops like hybrid paddy, vegetables, groundnut, turmeric, ginger, BT cotton with its improved varieties.

Main problems of tribal farming:-

- Poor in education (illiterate), Low economic Status & adoption
- Lacking of self confidence to accept new technology
- Traditional leaving and lack of technical know how
- No aim for self upliftment
- Small land Holding
- Poor mechanization of agricultural Implements, irrigation and plant protection equipments
- Mainly rain fed farming

Opportunities of Integrated farming system for high income & sustainability in tribal areas:-

- Agro forestry: Forest tree with agricultural crops.
- Silvi-pastoral: Forest with pastoral and animal rearing.
- Agri Silvi pastural: Forest tree with pasture crops & agricultural crops.
- Agri Horticulture: Horticultural & Agricultural crops.
- Agri pastural : Agricultural crops with animal keeping.

This system may be effective as per resources available.

Creative job opportunities through processing, value addition & marketing system in tribal areas:-

- Small processing units (Grading, Cleaning, Packaging) for rice, pulses, oilseeds, cashew and related crops may help tribal farmers to increase value of the agricultural products, which gave them more return in markets and it also help them to generate employment in villages during off season.
- Value addition by pickle making and pulp preservation in fruit and vegetable crops.

Protection of natural recourses in tribal farming:-

Mostly tribals live on hilly area of Gujarat state which is backward in socio-economic value. Where natural resources like soil and water need conservation. For this watershed area development technology require to be followed for conserving such resources.

Conservation of bio-diversities (plant, animal & fisheries) in tribal areas:-

Many species are protected by people because of their traditional belief. Traditional ideologies conceptualized in " Jeev Daya" (Compassion for life) ideal for all animals is respected by the Vala Kathi, Vala Rajputs, Patels and Jains of Saurashtra and North Gujarat region. The traditional knowledge has helped in conservation of natural resources like water. The agriculture was mainly rainfed and through years they have evolved technologies to harvest rain water by recharging of ground water and construction of storage tanks and stepwells to meet and improve their economy and basic needs.

Local people have knowledge about the flora and fauna, their utility, interaction between the flora and fauna, the seasonal variations in the ecosystem and other such details of the functioning of the ecosystem. They understand the ecology processes through experience and observation.

Women and youth empowerment in tribal areas:-

In general tribal women are more dominate than man and have more decision power for agriculture and house hold activity. They are having higher responsibility and heavy burden of work as compare to man. It is needed to train them for vocational work.

Opportunities for Agricultural University to help to develop tribal areas farming:-

Agricultural University helps to develop tribal areas farming by training & demonstration of new technology at tribal areas for agriculture, veterinary, fisheries, and related branches. University research activity for tribal area may help to improve farming of area. Group formation and according to need of group, University organizes various programs for socio-economic upliftment of tribal farmers.

Developmental Schemes of Tribal Areas:-

Considerable attention has been given to the development of Tribal areas in Gujarat during last two decades and streamlined machinery for providing necessary inputs to the target population was created. The State Government made sincere efforts to ensure that around 15% of the budgetary provision is spent in the Integrated Tribal Development Project areas. Due to these efforts, the poverty levels have declined, literacy levels have improved and a reasonable infrastructure (both social and civil) has been created. These efforts have improved the physical quality of life in these areas.

Government of Gujarat acknowledges that the headway made by tribal communities is insufficient and the tribal communities require more efforts than the existing constitutional provisions. For the 11th five year plan period, the government has initiated an ambitious programme called **"Chief Minister's 10-Point Programme for Tribal Development (Vanbandhu Kalyan Yojana)"** and allocated Rs 15000 crore. The programme covering all 43 blocks in Integrated Tribal Development Areas (ITDAs) spread across ten districts is planned as an integrated, holistic and all-inclusive one and will benefit Below Poverty Line (BPL) families. It aims to make the communities partners in the development process and improve their lives in core areas such as livelihoods, education, housing, health, drinking water, irrigation and basic facilities.

The highlights of the 10-point programme are:

1. Employment Opportunities for 5 lakh Families

- Creation of more employment through productivity enhancement in agriculture sector
- Increase in animal husbandry and dairy based activities
- Quality skill training for tribal youth
- Preference to women-headed households

2. Quality of Education and Higher Education

- Higher secondary schools for science in each taluka Provision for enrolling 1000 students in nationally recognized residential schools and creating a talent pool for tribals
- Residential schools in each tribal taluka and making them comparable with quality urban schools
- Establishment of excellent academic units including engineering and medical colleges, polytechnics, nursing colleges and ITI colleges

3. Economic Development

- Annual allocation of Rs.1 crore per taluka for development of identified economic activities through a cluster-based approach and market linkages
- Linking remote tribal areas to nearby economic centers through development of basic infrastructure and facilities such as roads, water supply, irrigation and continuous power supply in all tribal areas
- Value addition to local natural resources for higher returns to tribal families

4. Health

- Benefits of Chiranjeevi Yojana to all ST families
- Annual health check-up programmes for all ST families
- Removal of malnutrition in pregnant and lactating mothers as well as children under the age of 6 through effective implementation of schemes

5. Housing

- Housing for all ST families within the next five years

6. Safe Drinking Water

- All ST families to get safe, assured and adequate drinking water within the next five years
- At least 25% of the ST population to get access to piped water supply

7. Irrigation

- Emphasis on group irrigation schemes
- Creation of water conservation structures on watershed basis
- Financial and technical assistance for promoting drip irrigation

8. Universal Electrification

- Electrification to all hitherto uncovered hamlets
- Alternative arrangements through solar energy for remote and dispersed hamlets
- Free electrification to all BPL families

9. All-Weather Road Connectivity

- Improvement in the quality of roads in tribal areas
- All hamlets with population of less than 250 to be connected by roads
- Special drive for repairing existing roads in tribal areas

10. Urban Development

- Development of 13 tribal towns to act as growth engines
- All tribal talukas to get connectivity within next five years

Achievements up to 2007-08 under CM's Ten Point Programmes:-

- Vadi : 5400 Acres, 87000 households in last 3 years
- Dairy: 2.2 lakhs Litres, 25000 households
- Water Harvesting :12000 Check Dams, 22,000 ha through lift irrigation, emphasis on drip irrigation
- Jyoti Gram Yojana: All villages covered
- Kanya Kelwani: Focus on low literacy tribal villages
- Krishi Mahotsav: 85% Villages Coverage, 2.5 lakh Soil Health Card & 20,000 Kisan Credit Cards issued
- Doodh Sanjivani: 200 ml Sweet, Flavoured, Fortified Milk daily
- 52000 School Children, 2 Talukas on pilot basis
- WiMAX: Broad band Connectivity, 1st in Chhotaudepur
- BioMatrix: To monitor attendance in 100 Ashramshalas
- Pre-paid meters for migrating families
- LPG- 1,00,000 connections for tribal areas, priority to women headed HHs
- Access of high quality health services, free of cost, facilitation for procedures and diagnostic tests by a dedicated attendant, Augmented nursing staff, Clean environment, Sanitary Pad Units in rural areas- low cost, high quality sanitary pads to improve personal hygiene and reduce gynecological problems

Pilot Projects

Eklavya Model Residential Schools

- High quality, urban level public schools for meritorious children
- Average expenditure- Rs. 25,000 per child/ year
- Capital cost- Rs. 3 crore per school
- 43 schools proposed, 8 already running
- Management to be outsourced to reputed schools
- Participation of industrial houses being sought

CM's Ten Point Programme actively seeks private sector participation for-
Implementation of large, labour intensive projects in tribal areas

- Grant @ Rs. 30,000 per family Plus credit
- Provision of required infrastructure
- Outcome guarantee

Setting up modern skill training schools

- Full capital & recurring cost by Government
- Full employability to be assured

Supporting EMRS

- Support for capital/ recurring cost
- Management of schools

Governor of the State has special powers concerning

- Prohibition or restricted transfer of land of ST
- Regulation on business of money lending
- Selective application of state legislations
- Submission of annual report on administration of the area
- Constitution of Tribal Advisory Council
- Application of Panchayats (Extension to Scheduled Areas) Act.

Tribal Area Sub Plan:-

- A comprehensive review of the tribal issue was first done on the eve of the fifth five year plan (1974-1979) which lead to the tribal sub plan.
- Integrated approach on the basis of geographic and demographic concentration.
- Specially earmark budget for tribal areas in proportion to their population.
- Funds are not divertible
- Tribal development Department entrusted with planning and budgetary powers for TASP funds

Integrated Tribal Development Projects.

Gujarat Pattern Funds

Funds allocated for decentralized planning

- Sector-wise funds devolve to the district
- District level Tribal Advisory Board develops & implements plans
- No financial approvals required
- Funds mainly meant to provide for missing links, economic development & infrastructure
- 20% funds kept at state level for inter-district projects

Findings of Tribal Need Assessment Study (Taleem, 2007)

Area	Percentage
Housing	45
Quality-Education	44
School Enrollment	34.5
Better Health	32
Agriculture Production	24.5
Milk Production	24
Better Infrastructure	21.5

Findings of Tribal Need Assessment Study (By Taleem-2007)

Schemes	Percentage
Housing	80
Health & Sanitation	58
Education	45
Animal Husbandry	37
Nutrition	35
Agriculture	34
Irrigation	22

Literacy Rate among Tribal Population

Year	Rate(%)
1961	11.7
1971	14.2
1981	21.1
1991	29.7
2001	47.7

Efforts Made By Navsari Agricultural University for Development of Tribal Area:-

The Navsari zone of erstwhile GAU had attained the status of independent State Agricultural University (SAU) with the promulgation of Gujarat Agricultural Universities Act 2004 on May 1, 2004 heralding formation of Navsari Agricultural University (NAU) with Navsari as head quarters. NAUs jurisdiction covers seven districts of South Gujarat viz., Narmada, Bharuch, Surat, Tapi, Navsari, Dangs and Valsad. On these seven districts and 23 taluka are tribal. Besides Agricultural, Horticultural, Forestry and Agri. Business Management in the University a full fledged faculty of Veterinary Science & AH. at Navsari as well Agricultural Polytechnic at Dediapada under the aegis of Chief Ministers Ten Point Programme for holistic upliftment of the tribal areas of the State.

Extension Education Programme in Tribal Area:-

The extension education set up comprises of four Krishi Vigyan Kendras (KVK) located at Waghai, Vyara, Navsari and Dediapada. The major objectives of extension education are to transfer the developed technologies to the farmer's field effectively, to generate middle level technician and self employment in rural areas. Total 28824 different extension programmes like Front Line Demonstrations, On Farm Testing, and Khedut Shibir etc. carried out by NAU in tribal area and 536497 man days were utilized and benefited tribal farmers. During Krushi Mahotsav various activities were carried out under the events like Mega Krushi Mela, Technical Seminars and Agriculture Exhibitions at University head quarter and at Block level to improve the awareness of tribal farmers.

A special programme for holistic Development of 20 adopted Villages of South Gujarat; KVKs of NAU has implemented different 9 projects under RKVY in 20 villages of south Gujarat with a total outlay of more than Rs. 7.00 crore. This involve Agriculture production related nine components like, Low Cost Green House, Wadi Project (acre), Training and Demonstration on Preparation of Superior organic manure, Small Scale Nursery, Mobile Soil & Plant health clinic, INM in vegetables (acre), TOT through training, TOT through Demonstration (acre), Tribal Training cum demonstration center where in 10552 beneficiaries have been involved.

Remarkable Achievement of these projects

- More than 700 farm families became aware about this technology.
- 300 low cost green houses have been fabricated in thirteen adopted villages. These structures are being used for raising nursery.
- The good quality grafts were provided to the farmers along with recommended quantity of chemical fertilizers and pesticides. 65 % survival rate was observed. It is going to be a regular source of income after 6-7 years.
- Farmer got an income about Rs. 50,000/ha by taking inter crop and technical support. 300 Compost pits (5x5x1m), has been dugout at six adopted villages. These pits are now being utilized for making compost. The farmers are now recycling there farm and animal waste in to useful organic manure, Hence started saving on chemical fertilizers up to 50%.
- Twelve Small scale nurseries were built at farmer's field. In the last winters farmers raised vegetable seedling mainly onion, cauliflower, tomato etc. Seedling worth rs.160000/- were raised and distributed/ sold to the farmers from 2 SSN at KVK farm.
- 100% farmers will get soil health card in adopted villages. Farmers were benefited on spot guidance through diagnostic visits for pest & disease management.
- Thirty rabbit units, 100 chaff cutters are also being distributed among the farmers to uplift their socio economic status. The direct beneficiaries under this component are more than 1330.
- Increasing trend is found in yield of vegetables in INM (about 16%) Farmers could get return of Rs.0.50 lakh to 0.90 lakh / ha by growing watermelon with INM. Shri Shitaram bhai of village Chinchingaontha earned Rs. 117000/- from 1.5ha land by growing watermelon with INM.
- Seventy five training programme were conducted covering 2573 farmers from adopted villages. More than 900 farmers benefited during varietals demonstration. Yield increased 10 to 15% under different crops.
- Farmers are ready to replace old variety. SRI method performed better in the field. GR -7 performed better, the yield was 15-20% more than the old varieties of paddy.
- Total 33 success stories are prepared as a result of above extension activities in tribal areas, out of them 6 success stories are published for the use of farmers.

Activities coordinated in ATMA project in District Tapi, since 1-4-2008 By NAU:-

Cafeteria of activity under ATMA scheme like training demonstration, exposure visits, Krishi Mela/exhibition, farmer's day, farm literatures, capacity building programmes and farm schools were coordinated for crop diversification, varietals improvement, organic farming and animal health care etc. Total beneficiaries were 1, 03,668 tribal farmers. Twenty three success stories are prepared as a result of above extension activities.

NAIP Objectives for Development process and sustainability of livelihood of tribal families:-

ICAR in NAIP component III sanctioned project with an outlay of Rs.159.84 lakhs. It is implemented in Dang district in two clusters of 6 villages with an objective of

- Enhancement of agricultural productivity and profitability through proven technological intervention
- Management of natural resources
- Employment generation through agro processing, value addition including storage, packaging, transport and marketing and
- Empowerment through capacity building and skill up gradation.

Effect of Projects:-

- High Yielding/Improved Varieties of four prevailing crops (paddy, nagli, vari, niger) of Dang district were promoted in six villages covering 365 ha area amongst more than 449 farmers.
- The per cent increase in yield (2009-2010) of different crops varied from 3.43 - 59 % over base line.
- Under crop diversification activity, the increase in income due to diversification is more than 20 % over nagli, the normal crop grown by the tribal farmers. Groundnut crop exhibited the highest per cent (184 %) increase in income.
- Low Cost Green House (LCGH) constructed in each of six villages fetched about 13-38 % higher income to the farmers at the primary stage.
- Out of 77 ha land suitable for leveling and terracing activity, 27 ha was covered up and the activity increased crop production on an average by 18 %.
- Soil Conservation activities (Field bunding with stone or stone + soil) increased area for second crop and also increased cropping intensity by about 7 %. Out of 847 ha land suitable for water- shed intervention, 692 ha land was covered up with BAIF together.
- Twenty temporary check dams (TCD), fifteen small farm ponds and one water tank with increased capacity, were constructed/ developed/ renovated for water conservation, rain-water harvesting & storage and supplemental irrigation facilities.
- 63334 no. of plants (Mango, Guava, Sapota, coconut, Custard apple and other forest species including bamboo and Vetiver grass saplings, etc.) were planted in order to have fruits in near future from horticultural plants and also as measure to control surface soil erosion and nutrient loss by the forest trees and grasses.
- Four check dams, 1 Motor foundation structure were repaired and surface irrigation and MIS (Sprinkler) facilities were created respectively for increasing water storage and additional irrigation facility for 52 ha of land covering 125 nos. of tribal farmers.
- Preparation of compost and Vermi -compost were promoted amongst farmers/ farm-women as source of organic nutrients and income generation.

Women Empowerment by Means of Processing and Value Addition of Forest Produces for Livelihood Security in Tribal Areas

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ABSTRACT

Tribes constitute an important segment (approximate 8.08%) of the Indian population. Most of the tribal population lives in the forest ecosystem. Tribal population critically depends on forest and forest produces for their subsistence and livelihood. The Tribal women have a heritage of close association with the forest. The associations in the form of economic activities and livelihoods, which are more often informal and unorganized. The present study is conducted to find out the livelihood options covering food security through processing and value addition of forest produces for the women empowerment in tribal areas. In the present research work, 75 households of 12 villages in 3 Blocks of Bokaro district were covered. In the study area, majority of the families (93.33 %) were of nuclear type and 37.33 % families had total 5 number of the family members. Approximate 56% adult male were educated upto the 10^{TH} class. Agriculture was the primary occupation in the village. All the information given by village people on various forest plant and its multipurpose use is complied and is divided into enterprise wise in different groups. A number of wild fruits are consumed as curries, pickles and chutney by them. Wild fruits like Mahua (*Madhuca latifolia*), Jack fruit (*Artocarpus heterophyllus*) and Tamarind (*Tamarindus indica)* etc. can be processed and preserved easily as jam, jelly and other food items. In the season of plenty availability, they make sun-dried powder of various tree based leaves and store for use in the lean period. If it is done in scientific way,it will be an excellent rural enterprise. In view of the edible oil shortage in India, the unconventional source of edible oil e.g. Mahua oil, is of great importance. Forest plant like Jamun (*Syzygium cumini*), Karanj (*Pongamia* pinnata), Mahua (*Madhuca latifolia*), Kend (*Diospyros melanoxylon*), and Bhelwa (*Semecarpus anarcardium*) etc have excellent medicinal properties, therefore, there is bright scope of forest tree based medicine enterprises in the Jharkhand. From the present study, it is very clear that forest produces have immense potential to solve the problems of poverty and food insecurity round the year. The prospects of rural industries development by processing and value addition are exceedingly bright in the tribal areas.

India is the second most populous and seventh largest country in the world with a forest area approximate 23.68 % of its geographical area. Forest is the second largest land use system after agriculture. Forest remain from the beginning , very good source of foods, fodders, fuel, timber and various other non-wood forest produce for the forest dwellers as well as for the rural communities living in and in near-by forest areas.(http://jharenvis.nic.in,2010) Out of 0.6 million villages in India, around 0.2 million villages with a population of about 350 million are dependent for subsistence directly or indirectly on the forest (Malik et al,2010).Approximate 50 million tribal people in India depend on forest produce for meeting their subsistence, consumption and income needs. A large proportion of employment generated by forest produce accrues to women (Prasad, 2007).

Tribes in India: The word "Tribes" means any aggregate of people united by ties of descent from a common ancestor,community of customs and traditions, adherence to the same leaders(Stein and Urdang,1970).The term"Scheduled Tribes" refers to specific indigenous people whose status is acknowledge to some formal degree by Indian legislation (http://en.wikipedia.org).

India has a variety of tribal population, reflecting its great ethnic diversity. Tribes constitute an important segment (approximate 8.08%) of the Indian population. Most of the tribal population in India lives in forest ecosystems and has its own kind of socio-cultural pattern, traditions and typical food practices (Sinha and Lakra, 2007).

Tribal population critically depends on forests and forest products for their subsistence and livelihood. Forest produces have been supporting this population for 6-8 months in a year, both in terms of subsistence and cash benefit. According to Planning Commission, Govt. of India, income derived from selling of NTFPs constitutes around 60%of the total annual income of tribal households (www.vasundraorissa.org).

About two-thirds of India's forest-cover lies in tribal districts where the incidence of poverty is high, tribal areas in India mostly happen to be the centres of civil strife and remain nearly disintegrated from mainstream polity (Ghosh, 2010). Economic development not sensitive to the ecologies of their habitations and their special ties with the environment has alienated these people from main stream development and in many cases become cause of militancy and civil strife.

Status of Tribal Women in India:

Another marginalized category now a centre of global concern is comprised of tribal women who disproportionately bear the responsibilities of home and earning in conjunction with social evils of exploitation and poverty in majority cases. Even in modern civilization, the tribal women are victims of illiteracy and poverty more viciously than other women in the country and are additionally vulnerable to militancy in civil society, to family alienation due to migration, exploitation in the labour market and social evils like polygamy, alcoholism and domestic violence.

The tribal woman is far more participative in economic life than other groups. Participation rate in economic activities of women aged 15 to 59 years age is 61 per cent. In spite of their active role, considerably higher proportion (43%)of tribal women belongs to very low expenditure classes of households than overall women. The expenditure share of tribal women is higher than tribal men indicating greater concentration of women in poor households. Women's commitment to home such as caring of children and other constraints may come in the way of their movement away from their roots. With agriculture yielding little employment and income generation opportunities, their utter dependence on primary occupation is a matter of concern (Ghosh, 2010).

Relationship of Tribal Women with Forest:

Tribal people are predominantly agro-forest based. The forest land is characterised by undulating terrain, difficult communications and low population density, mostly inhabited by tribal whose life and economy are dependent on agriculture and forest products. They have limited land resources for agriculture. Tribal living in the forest tracts earns their precious livelihood from innumerable fragments of agricultural land. The associations of women with forest in the form of economic livelihoods are informal and unorganized . Tribal women are the

After covering the full areas of the forest, the schedule was filled randomly by informal interviewing a number of village people who had good knowledge about different types of edible produces of the forest through regular visit of the forest, since a very long time, perhaps from their own childhood. Because in the tribal culture, it is general practice that women involved their children in the collection work and spend a lot of time in the forest. Tribal women and their children spend more time as compared to their male partners.

Observations, Results and Discussion:

Through the survey work, a lot of valuable information was obtained both from old people who had deep knowledge regarding forest produces and its multi-functional use in their life and from young tribal people who played active role in the collection of all relevant information needed for the study. In this study, the investigator covered 75 households covering 12 villages of 3 Blocks in Bokaro District.

1. General Profile of Tribal Family:

(a)Type of the family: In the study area, majority of the families (93.33 %) were of nuclear type ,whereas only 6.66 % families were of joint type. This information clears the picture of "shifting in the trend of traditional values in tribal society".

(b)Family size: Family size is the most important criteria to determine the socio-economic status of any family. In the study area, majority of the families (37.33 %) had total 5 number of the family members, whereas the second large group of the families i.e. 32 % families had total 4 number of the family members. Only 2.66 % of the families had maximum, total 7 numbers of the family members. It is very good sign, from population control point of view.

Unlike in the other population section, the tribal people hardly show an adverse sex ratio especially in the 1 to 7 years age group reflecting no sign of early sex discrimination. The overall sex ratio of the ST population in Jharkhand is 987 females per 1000 males which is higher than the national average (978) for the total ST population. (www.jharkhand.nic.in,2010.).

(c)Family income of the households: Since tribal people, whether men or women hesitate to provide any kind of information regarding their income, so it was very difficult for the investigator to have these kind of information. The range of the family income through farming was Rs 2000/- to Rs 25,000/ in a year. Tribal people were not very much clear about their total earnings through agriculture. On the basis of the crude information given by them, the range of per capita income calculated was Rs 500/-to Rs above 2500/- of their families.

(d)Educational status o tribal men and women: Education is the best instrument for judging the development of any society. Regarding the educational status of the adult male, majority of them i.e.56% were educated upto the 10th class where as second large group i.e. 17.33 % of the adult male were illiterate. Only 13.33 % of the adult male were educated upto inter level and 6.66 % was done Graduation.

It is the female education which can bring revolution, so it is essential to know the educational status of the home-makers of the study area. Regarding their educational status, the majority i.e. 58.66 % of the tribal women were illiterate whereas, the second large group i.e. 22.66 % had educated upto the 6^{th} to the 10^{th} class. Hardly 1.33% of the tribal women were Inter pass. But, no one was graduate. So it is essential to impart education to women.

linchpin that connects the livelihood strategies of tribal households with forest wealth. They are primary persons in the collection, processing, and marketing of forest produce .They gather the bulk of forest produce, including food and fuel-related forest products and sell in the local market. Men are mainly responsible for construction timber, poles and some collection of medicinal plants which are also gathered by women. Women, according to studies in Uttar Pradesh, derive a greater proportion of their income from forests; poor women derive 45 percent of their income from forests (www.fao.org, 2010).

The present study is conducted to search out livelihood options for tribal women from forest through processing and value addition to make them empowered.

METHODOLOGY

LOCALE OF THE STUDY: The study was conducted in Bokaro district(covering 12 villages of 3 Blocks) of Jharkhand state in 2010 year.

TOOLS FOR DATA COLLECTION: In initial phase, frequent visit were done for developing rapport with the village people, especially with the older people and well known youth persons who were linked with various government and non-government as well as other social activities of the villages.

A pre-structured schedule was developed and it was pre-tested on non-sample group of the study area. The necessary modification was made accordingly. Different types of tools for data collection were chosen as per the purpose of the research work. These tools were (i) Informal interview (ii) Observation(iii)Rapid Rural Appraisal (RRA) (iv) Transect walk.

(i) Informal Interview: Through informal interview, data regarding income was obtained because tribal people hesitate to provide any kind of information in this aspect. Therefore, accurate picture of their socio-economic Status was very difficult to obtain. Only a rough estimation was done with the help of informal interview.

(ii) Observation: Tribal people was not able to tell about "Type of Plant" whether it is herb, shrub or tree at the time of giving information about these forest foods. This type of data was collected by direct observation of the plants in the forest.

(iii)Rapid Rural Appraisal (RRA): A rough list of forest based edible food produces, was obtained through RRA. Indirectly, the investigator tried to know their food consumption pattern or their dietary habits.

(iv)Transect walk: After 3-4 regular visit to the village and deep conversation session with the different groups of village people, an informal team was made with active type of tribal men and women. The objective of the study was made very clear through various conversation session and discussion with them, after that the investigator went on 'Transect Walk "along with them.

Data Collection Procedure: In the morning, when tribal women finished their first half household chores and breakfast was done by all their family members, the investigator entered the nearby forest along with them and returned before evening, so that those tribal women could finish their rest of the household chores as well as from security point of view, since the forest was dense. During visit, all the information given by them noted seriously with great attention. This procedure was followed repeatedly until whole areas of the forest was not covered.

The overall literacy rate among the STs has increased from 27.5 % at 1991 census to 40.7% at 2001 census. Considering the present data, it appears that the literacy level has increased upto 20% in last ten years.It is very clear from this data that for bringing desired level of the development in the tribal society, they have to go a long way. **(www.jharkhand.nic.in**2010)

(e) Primary occupation in the village: In rural areas of the Jharkhand state, the primary occupation is agriculture. But, in the present situation of occurring frequent drought condition in the state from last 5 years continuously, it is essential to have clear picture of their occupational status. That's why the information on **kinds of occupation** is investigated. Regarding occupational pattern in the survey areas, it was found that in the 89.33% of the families, main occupation was farming, whereas in the approx.6.66 % and 4% families had service and independent type of occupation(e.g. driver and contractor etc).

(f) General Meal Pattern of Tribal: Their **general meal pattern** was consists of three meal in a day throughout the year except at the time of celebrations and ceremonies. They took breakfast in the morning because most of them had to go on their work either in the field or on labour work. In the noon period, they took Lunch, which was the same Rice and Vegetable, cooked in the early morning. Tea was not a habit in their daily routine. Snacks was generally not taken by the adult persons of the family, it was given only to the children.

Their breakfast or lunch, both was commonly consisting of Rice and Vegetable, sometimes they took dhal also. The most important thing is that they were very fond of Non-vegetarian diet. Even in the prevalence of high poverty, they made some arrangement of it in any way e.g. they caught small fish from river. Chingri fish was their most favorite fish.

Dietary Pattern of Tribal: Their diet comprises variety of unconventional and wild foods viz. edible forms of flowers, fruits, tubers, leaves, stems, seeds, and wild mushrooms. Tribal mostly eat vegetables of leafy varieties, and depend on such natural products for their food. In the time of scarcity or when the staple food is in short supply, people are in general dependent upon various species of wild plants.

During the study, a number of forest plants, which have great significance in their daily life from foods, medicine to the livelihood need, were enumerated. All these plants are discussed later on.

2 Prospects of Processing and Value Addition Based Enterprises in Tribal Areas:
All the information given by village people on various forest plant and its multipurpose uses is compiled. These compiled information is divided into enterprise wise different groups according to their use.

(a)Primary Processed Forest Products Enterprises: Tribal generally have no idea of even simple business strategies, therefore they sell the collected forest produces in the local market in original form without doing any kind of processing or preliminary value addition. That's why, these tribal can be trained on primary processing along with simple packaging practices for value addition of these produces. Two costly forest produces like Mushroom and Rugra can also be nicely cleaned, dried, well packaged and sold in the market as they are very muddy because they grow in sand or very below the surface. Their cleaning process is very difficult, tedious and time

taking job. Different kinds of raisins e.g. Sakhua and Mahua, can be easily graded on the basis of their quality. Deseeding and defibreing of tamarind and preparation of tamarind cake can be done at household level. Edible oil extraction with traditional or country method have bitter taste, dull colour and pungent taste. So, they can be trained on new methods of edible oil extraction, which does not involve sophisticated machinery, huge financial involvement and very advance technical know-how. Some people also extract Neem oil and Karanj oil for medicine purpose. It would be desirable to give technologies for oil extraction through power ghanis along with financial support. Most famous "**Chirounji**" which is well known dry fruits and is used in various preparations e.g. Kheer and sweets. Large amount of **chirounji** is exported. It is very costly in abroad having price is approximate Rs 400/Kg,but it is sold in local areas little bit cheaper. Piyar seed oil is very good substitute of Almond oil in various medicinal preparations, therefore, its processing and packaging should be of excellent quality. All these efforts will help these people in the establishment of different kinds of primary processing based enterprises at regional level which will accelerate employment opportunities in the tribal areas.

(b) Home Scale Secondary Processing Based Enterprises: The various wild fruits and flowers are collected from the forest, some are consumed as fresh while others are processed for home scale use in the season of non-availability.

(i) Mahua: Mahua is a major tree which provide various enterprises and is used in different ways after primary and secondary processing.

Mahua Flower: Raw and fresh Mahua flowers are eaten by boiling. In the night, the Mahua flower is boiled and in the next morning it is eaten as such in breakfast just like boiled potato. Raw and fresh Mahua flowers are sun-dried and then they consumed by roasting it.The roasted sun-dried Mahua flowers are called as "PHOKA". Using a proper processing and packaging technology Phoka can be sold in market. Only 2 or 4 Phoka is kept in one glass of milk in the night and it is taken as nutritious and healthy tonic like Horlicks in the next morning.

From Mahua flowers sabji,sweets and other different preparations are made. Phoka are eaten by making laddu. From Phoka and mixing of various other ground ingredients e.g. roasted Maize/Wheat/Bengal gram flour, Niger seeds, Sakhua seeds, Tamarind seeds(by removing outer cover of seeds),and Mahua laddu prepared. All these materials are ground and mixed in traditional Dekhi. According to the information given by respondents; Phoka=1kg, roasted Maize/Wheat flour=150gm and rest all materials are mixed according to the taste. In the preparation of Mahua laddu,sugar or jaggary is not used,it has high sugar content.

Mahua Fruit: Mahua fruit is automatically dropped on the ground in August month.Unripe Mahua fruit is plucked with stick.Ripe Mahua fruit is also called as Kochra/Kauni. Sabji is prepared from Mahua fruit and from its thick outer cover,they made Badi. For making Badi,outer thick cover is soaked in water at least for 12-15 hours. Then all extra water is removed, ground and shaped into tiny balls and well dried under hot and intense sun. They store these Badi for use in lean period.

(ii) Jack Fruit Tree: From raw jack fruit,sabji is prepared. Ripe Jack fruit seeds are made into flour, from which they prepared Roti. This flour should be weighed and sealed and packets are made available in the urban market also. Muchi, the central thick and round stem of ripe Jack fruit, is very popular among tribes and they made sabji from it. According to them, it is more tasty than mutton and fish. It is sold having price Rs 30-40/Kg. According to tribal people, it is hard to digest, so people with weak digestion capability should not eat it.

(iii) Koraiya Shrub: Roti is prepared by boiled and mashed Koraiya flower. They prepared sabji from fresh flowers.

(iv) Sakhua Tree(*Shorea robusta)*: Sakua seed along with Phoka is used to prepare laddu.

(v) Piyar Tree: From Piyar flower and raw fruit, sabji is prepared, which is very good for eyesight and dysentery.

(vi) Amada Tree: From raw,young and tender Amada fruit, they made curries and chutney

(vii) Kusum Tree: They made sabji from its flowers.

(viii) Kend Tree: Tribal people made Kheer from the Kend seed by removing its outer cover. Wild flowers like Mahua,Sakhua,,Kusum ,Koraiya and Piyar flowers etc are used as sabji according to their availability in different seasons. Among these tribes, Jirhul flower and Mahua flowers are very famous .and these are sun-dried and preserved for long period. If these food items are dried scientifically and packaged properly, it can fetch higher price in the market.

Mahua laddu can also be stored at least for few days and may be sold in local shop for use in breakfast or snack items.Badi or tiny sun-dried balls are used for annual consumption which is prepared by the boiled and mashed Mahua fruit's outer thick layer and other forest produces, which can also be sold in the local market.

Since Phoka(sun-dried and roasted Mahua flowers) is nutritious, so it needs proper packaging, labelling and advertisement to be used as local health drink by mixing it in the milk like Horlicks and Complan available in the market. These forest produces can be well exploited through proper processing, packaging and advertisement. It will definitely help in giving home based income generation activities and enterprises for them.

(c)Processed Forest Food Based Enterprises: Processed foods like jam, jelly, chutney, pickles are always in great demand. The pulpy forest fruits can be used for preparing jam and chutney. Fruits with good pectin content can be used for preparing jelly e.g.Jack fruit rind has good amount of pectin. So, it can be used for the preparation of readymade pectin. Pickles can be made by those fruits which can retain its shape e .g. Jack fruit, Aonla and Amada etc. Pickle industry is very big in India having worth 13645.16 metric tonnes in 2002-03(www.scribd.com, 2010).All these forest processed food is good source of income for tribal people specially for women.

Tribal people used a number of wild fruits in their routine life e.g.tamarind, mahua and jack fruit etc. These fruits can be processed and preserved easily. Wild Fruits can be processed into jam, jelly and other items and marketed. In case of Jack fruit, plenty of pectin is present in the rind,so Jam and Jelly could be prepared easily. Like wise, from Mahua flower which is good sources of many nutrients e.g.sugar,minerals and vitamins , they can also get huge income by processing and preservation of it. Pickles can also be made from a lot of forest produce e.g. Jack fruit(, Amada fruit(*Spondias mangifera*), young and new Bamboo shoot(Dendrocalamus strictus), Mushroom etc .In this way, forest produce can create enough employment, particularly for women. It will reduce or eliminate their dependence on collection and sale of fire wood. Now it is very clear, there is ample scope for developing processed forest produce based enterprises in Jharkhand.

(d) **Processed Tree based GLV Enterprises:** Diet of tribal consists of various types of forest tree based leaves. They were very fond of Munga(*Moringa oleifera*), Koinar(*Bauhinia purpurea)* and Putkal(*Ficus glabella*) leaves,when these leaves are soft, tender and young. It is their general practice that in the season of plenty availability of these leaves, they sun-dried and store for use in the lean period. If tribal women will do sun-drying process in scientific way and the colour and quality is properly maintained, it will be an excellent rural enterprise.

Now a days food companies are also interested in making healthy products for children. The dried leaves can be sold to big houses for incorporation in foods like noodles,pasta,biscuits and buns.

In mid day meal(MDM) program, children are to be provided with 75 gram of vegetables. The local Selp Help Groups(SHG) of tribal women can be made responsible for providing sun-dried vegetable to these schools. In this way the school children will get adequate quantity of vegetables and the tribal people shall get ensured income as the MDM program is operated throughout the year.The green leafy vegetables are rich source of calcium, iron, beta-carotene ,vitamin-c, and folic acid. *(Gopalan, 2004)*.These leaves were very inexpensive and easily available in the local village market. They may contain all important nutrients, as per their food group, required for growth and maintenance of health.

According to the NFHS III (conducted in 2005-06 year in Jharkhand),approximate 80.5 % of the children(6-35month age),73.4 % of the reproductive women(15-49 yrs age) and 68.2 % of the pregnant women in rural areas were found anaemic(**www.nfhsindia.org**,2010). Hence,these wild leaves must be consumed by children, pregnant and nursing women to obtain much needed nutrients i.e. beta-carotene, calcium and iron. This is particularly so important for predominantly Indian cereal-based diets of the poor who suffer from the dietary deficiencies of these nutrients.

(e) Unconventional Edible Oil Based Enterprises: In view of the edible oil shortage in India, the unconventional source of edible oil e.g. Mahua oil, is of great importance.

Mahua oil: Mahua tree is very good source of edible oil since very long time,that's why traditionally ,it is also called as Indian Butter Tree. Mahua oil is pale-yellow coloured and semi-solid fat. From Mahua seed, three methods are used for oil extraction. First, by mechanical ghanis, second by traditional method.e.by putting pressure with the help of some heavy load. Third method by using improved method or by using improved appliances/equipments. But the shelf life of Mahua oil extracted by traditional method is more as compared to other two method.

Mahua oil has multi-purpose use. Old Mahua oil looks like GHEE. It is used as cooking oil as well as for the lighting purpose. It is very good substitute of refined oil and ghee. From this oil, they made sabji and all kind of sweets and other preparations. Mahua oil is also very good source of income generation. The price of Mahua oil is Rs 40- 45Kg. The amount of Mahua oil obtained is about 40% of total amount of its seed quantity. Mahua seed is broken into very small pieces called as dhal and is sold in open market also for oil extraction.

(f) Forest Tree Based Medicine Enterprises: On the basis of information collected regarding forest plant like Mahua, Jamun,Kend, Neem,Sakhua,Bhelwa and Karanj etc.given by village people, it is very clear that there is very bright scope of forest tree based medicine enterprises in the tribal areas.Traditional knowledge of tribal people regarding various forest plant's multifunctional use is collected and compiled. During the survey work, it was observed that the health and hygiene status of tribal people was very poor. They did not get proper nutrition. The multi-functional use of different parts of forest tree is discussed one by one.

(i)**Mahua Flowers**: As per the information given by local people, Mahua flower is useful in the treatment of Dhaat, Vaat and Pitth disease. In case of scorpion bite, Mahua flower is ground and kept on the affected part ,the effect of poison becomes less.

(ii)**Mahua Leaf**: In case of Hydrosil disease,the Mahua leaf coated with luke warm Mahua oil is tied on the painful area,the patient got great relief.

(iii)**Mahua Seed Oil:**The medicinal value of Mahua oil increases with time. Any kind of body pain is relieved by massaging with it.In case of stomach pain,the old Mahua oil is either massaged over the stomach or it is consumed as medicine. It gives relief to the affected person. Excessive use of Mahua oil is harmful.

(iv)**Mahua Cake:** It is used for the treatment of itching problem.

(v)**Mahua Bark:** Mahua root and bark also have good medicinal properties. The village people made DANT-MANJAN (tooth powder) by mixing various kinds of Bark powder. To prepare this DANT-MANJAN,they mixed three different kinds of Barks i.e. Mahua bark, Neem bark and Babul bark. All these bark is burned in the fire and made into powder by well mixing. A very good DANT-MANJAN is ready.

In case of any kind of teeth pain, the powder of Mahua-bark is boiled in water and this water is used as mouth wash. Then, the frequent use of this indigenous mouth wash, the teeth pain is relieved.

(vi) **Mahua Tooth Stick**:There are two species of Mahua tree,in one species, Mahua flower is dropped in the day-time and in other species,Mahua flower is dropped in the night. The Tooth Stick of later species have good medicinal properties. All kind of tooth pain is treated by brushing with this Mahua tooth stick. In case of loosening of teeth, it becomes tight both either by the use of water mixed with bark powder or by brushing with Mahua tooth stick.

(vii) **Mahua Cake:** In case of mouth infection, the Mahua cake is burned in the fire and powder is made. This powder is mixed in the water and it is used as mouth wash, the mouth infection is treated.

(viii) **Jamun Tree:** Jamun fruit, seed and bark have excellent medicinal value. These are used to treat stomach related disorders and diabetes. Its bark is used as medicine in case of dysentery. Its vinegar is very beneficial to treat stomach pain. From Jamun bark "Dhaat" disease is cured. In Dhaat disease, the urine becomes red and it occurs in both in ladies and gents. For this treatment, Semal bark and Jamun bark, both are ground and is mixed in water. This water is used as mouth wash. Any kind of wounds are treated with Jamun oil, particularly in summer season.

(ix)**Sakhua Tree:** Sakhua is used in the preparation of blood purifier medicine. Its decoction is very beneficial. Its bark and leaves is cooked in sesame oil and all kind of ear related ailments is treated with it.

(x)**Karanj Tree:** Karanj oil is useful to treat wounds and face scares respectively. Malaria fever is also treated with Karanj. In case Piles, 5gm Karanj bark is ground and mixed in water,this water is continuously drink for 15 days to treat piles completely. Karanj Tooth Stick is very famous among Tribes and have excellent medicinal value. Karanj tooth stick is sold in market also.

(xi) **Bhelwa Tree:** Bhelwa seed oil is used to treat the feet wounds and cut wounds developed by working bare footed in the rainy season. Even those wounds developed by stone,is also treated by Bhelwa seed oil.

(xii) **Kusum Tree:** From Kusum seed oil, medicines are made which are used to treat itching problem. It is used for massage purpose also.

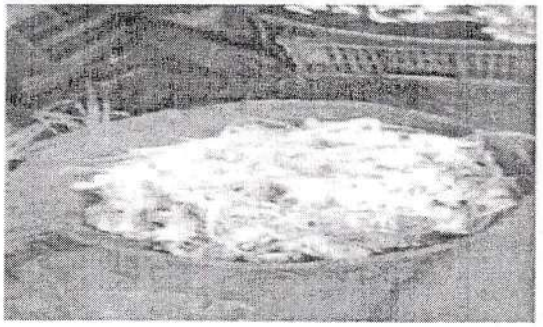
(xiii) **Neem Tree:** Neem leaves and Neem oil have very good medicinal properties. Neem leafves are ground and put it over the wound to heal it. In the month of May-June, it is the general practice in the tribal society, that they prepared sabji from new and young neem leaves along with the Potato and Brinjal. According to them, by the consumption of this sabji in summer and rainy season, all stomach worms are killed and stomach becomes cleaned. From Neem oil, medicine are prepared to treat the itching problem and wounds. Neem tooth sticks is very popular among tribal people. By the regular use of Neem tooth stick, all kinds of teeth related problem is solved.

(xiv) **Amada Tree** : Tribal people made various medicine from the Amada tree bark. They mixed Amada bark powder in water and drink it for the treatment of dysentery and other kind of stomach problem.

(xv) **Piyar Tree:** Piyar kernel is used as ointment in skin disease.

(xvi) **Kend Tree:**Tribal people use raw Kend fruits for the treatment of dysentery. Hence, there is urgent need of training programme for tribal people for the management of of diarrhoea,dysentry,malaria,T.B. and skin diseases e.g.leprosy. For treatment of these diseases, emphasis was given to utilize local herbal resources as far as possible.The local people could sell these forest tree based medicine and thus generate additional income.

Many countries in the world were protecting their natural wealth in some way but we in India were lagging behind. There is urgent need to conserve medicinal produce due to its excellent health benefits and other benefits e.g. various crop's yield is increased by the use of Neem and Karanj oilcake of. Government should give a lot of attention for processing various forest produce of medicinal value.The foremost requirement is to establish a quality testing laboratory in the local areas either by the Government of India or ICAR/ICMR. Suitable facility to evaluate the medicinal value of the product, should be given. There is need of proper certification procedure from any authentic organisation or institute. Govt. or voluntary organizations should come forward to help in this field.



(g) **Suggestive points for processing and value addition of forest products:**

There is great potential of processed and value added products based enterprise development in Jharkhand, but still, the quantity of these kind of products are negligible. Therefore, the following suggestive points should be urgently considered for proper processing and value addition of forest produces:

1.Tribal people should be given information regarding new and low cost technologies to preserve, process and package various forest products both to increase its shelf life and better market opportunities. The tribal people also should be trained in preliminary processing processes, storing, packing and marketing of value added and processed products at local level.

2. Government agencies should manage to finance, the tribal to purchase low cost equipment and tools for processing of forest produce at the household level.

3 For intensive processing and marketing activities, our government should provide infrastructures facilities to the tribal.

4 Efforts may be made by the department of forest and marketing to establish regulated market for value added and processed products.

5 Involvement of research institution is quite critical to understand and blend the traditional knowledge with scientific refinements for their large scale adoption and popularization.

6. It is necessary to develop simple processes for making medicine from forest tree's part having medicinal value to treat common ailments. Also popularizing these value added products in the local markets, will benefit both the local people and consumers.

7. Programmes for training of rural youth, especially farm women for post-harvest handling and value addition of the locally available forest-products, will help in linking rural communities to markets for better income opportunities.

8. Setting up of a quality testing laboratory to test and certify farm products (such as , medicinal part of forest plants etc.) produced by the local entrepreneurs is an essential requirement for which all kind of support i.e Government and NGOs support is critical. The available valuable knowledge relating to medicinal uses of local herbal plants need to be gathered and documented through appropriate incentive and reward mechanisms before same is lost forever or remains unknown/hidden.

9. Literacy programmes are launched on large-scale basis in the tribal areas. Malpractices by middlemen/private agents should be checked through government legal system.

10. The remote forest fringe communities must be complemented by infrastructure development (road, electricity); health and education systems; and development of the social capital in the tribal communities.

11. It is highly essential to document innovations and traditional knowledge and disseminate them further by the help of various organizations such as (ICAR) and also by regional institutions and link them to markets for better income and livelihood opportunities.

Conclusion

Freedom from poverty and food insecurity is viewed as an essential component of the empowerment of tribal women in the development of the nation. Development of economic conditions can only be acceptable if the livelihoods are pursued in an ecologically prudent way. Forests provide important benefits to the earth not only from foods, fuels, timber and other products but by their ecological impacts on weather, soil, water, their carbon sequestering role and their function as a storehouse of biodiversity. Forests can provide materials for the development of wide range of enterprises and economic activities from which tribal women could be benefited as entrepreneurs. According to the given information by them, forest produce have immense potential to solve the problems of poverty and food insecurity round the year. Thus, forest produce based enterprises has to play an important role in ensuring food and livelihood security for tribal depending on forest in Jharkhand.

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Backwardness of Tribal People - Reasons and Remedies

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Indian tribals are traditional, conservative and under-privileged people. They are socially and economically weaker and also under abject poverty and live in a subsistence economy and general backwardness. This is because of their ill health which is a cause and consequence of poverty. The major impediments to good health are inequity in health system and radical poverty of the masses. Illness lower learning ability reduces productivity, income and savings and it leads to poor quality of life and thus perpetuating poverty. Actually they constitute the matrix of India's poverty.

India has the largest tribal population in the world. There are almost 427 recognized scheduled tribal groups in India. As per 2001 census the tribal population in India is 84.3 million, larger than that of any other country in the world. Myanmar is the second largest with 44 million of tribal population. The tribals in India occupy 15 percent of the geographical area and they form 8.2 percent of the total population. In some States and Union Territories, they constitute the overwhelming majority of total population eg. Mizoram (98%), Meghalaya (90%), Nagaland (84%), Arunachal Pradesh (68%) followed by Manipur (38%)), Sikkim (28%), M.P. (24%), Orissa (22%) and Assam (21%). M.P. has the largest concentration in India. Gonda is the largest tribe in India followed by Bhills and Santhal. The tribal population in our country is mostly distributed in the forest zones of Eastern Ghats, Western Ghats, Central, North Eastern and Himalayan mountains.

In response to the militant revolts of the tribal people, colonial rule was forced to enact legislation to prevent the alienation of tribal people from their land. Several legislations have been enacted after independence also. However these legislation proved altogether ineffective.

The fraudulent transfer of land of tribal people to non-tribals has intensified after the mining sector has been opened up to corporate plunder. There has been massive eviction of tribal people from their land in order to handover the land to private corporation, Indian and foreign.

More than 15 per cent of them have been displaced without any comprehensive programme of rehabilitation in order to make way for development projects such as dams, manufacturing industries and mines. The traditional access of the tribal people to forest and minor forests resources has made them victims of the contractor-forest official nexus. These circumstances have forced many Adivasis into contract labour gangs and even to bonded labour and many atrocities are being committed on them.

To overcome these problems following measures may be undertaken :

- Forest conservation (Amendment) Act of 1988 may be amended. The degraded land should be distributed amongst the tribals with financial assistance from Govt. for horticulture.

- Implementation of a comprehensive rehabilitation package for displaced persons before undertaking any essential development project in tribal areas in consultation with local people.

- Wage employment, institutional credit, universal school education, health facilities, safe drinking water and food security through universal public distribution system and social welfare schemes in tribal areas are to be provided.

- The Govt. should come forward to maintain distinct identity of indigenous tribal art and culture and allocate funds for its proper promotion.

The law checks of Atrocities on S.C. and S.T. 1989 has been passed out which has been implemented from January 30, 1990. But almost everyday, the tribal people are facing atrocities from the upper caste people in any corner of the country. The women are paraded naked, gang raped then brutally murdered. We also read the incidents of honour killing. Most of these cases do not come in the lime light. Even those few cases which come in the daylight are subjected to farce in the name of judgment. The administration not only remains silent spectators in most cases but takes the side of the upper caste and torture the tribal people. Local Police Station refuses to accept FIR. Several lower and higher court have critised the Government for their inactiveness. How long these killings in the name of honour will continue ?

Unless and until we solve these basic problems, no improvement in their life can be done.

Conservation of Genetic Resources in the Tribal Areas of Western Himalaya

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Introduction

India possesses a distinct identity, because of its varied geography and great diversity in its natural ecosystems that have immense richness of agricultural biodiversity including diversity in crop plants, wild plants, livestock, aquatic species, microbes etc. India has 2% of the world's land area, 1% of its forests and 0.5% of its rangelands but supports world's 16% of the human and 15% of cattle population (FAO, 2003). Indian gene centre is one of the 12 mega diversity centres of the world and it has Himalayas, Western Ghats and Indo-Burma regions as biodiversity hot spots among the 34 identified the world over. The Himalayan biodiversity hotspot is the planet's highest and home to the world's unique biodiversity. The flora and fauna in the Himalaya provides a high degree of diversity at species level. It has more than 10,000 plant species, 300 mammals and 269 fresh water fish spécies. The naturally occurring flora primarily constitute the alpine herbs grow along the edges of melting glaciers while other like *Juniperus*, *Acer*, *Populus*, *Salix*, *Elaeagnus*, and *Prunus* occur along the river margins. Other common elements are *Capparis*, *Chenopodium*, *Corydalis*, *Dianthus*, *Inula*, *Matthiola*, *Nepeta*, *Peganum* etc. Much higher elevations ranging from 3900 to 4200 m are occupied with *Betula*, *Abies*, *Juniperus*, and *Pinus*.

It also house diversity of traditional agro-ecosystems including animal and aquatic resources, human ethnic races and other wild forms of flora and fauna. Farmers here maintain high levels of crops and animal diversity, which is unique and endemic to the region. Among animals, the important breeds of sheep and goat are Rampur Bushair, Gaddi, Biangi, Gurez, Karnah, Bhakarwal, Poonchi, Kashmir Merino and Changthangi among sheep; Chamba, Gaddi, Pashmina and Chegu among goats and Spiti and Chummarti among ponies. Besides, there are many non-descriptive breeds of cattle and other animals often reared by local and tribal communities including nomadic like Gujjars. The cold-water streams of the region provide shelter to about 82 fish species belonging to six orders and 13 families. The genus *Schizothorax* is represented by at least six endemic species in the high mountain lakes and streams, while two other genera of these snowtrout, the genus *Ptychobarbus* and the Ladakh snowtrout (*Gymnocypris biswasi*) - a monotypic genus now thought to be extinct, are also unique to the Himalaya.

These genetic resources, which have evolved and highly adapted to extreme environments of tribal region of Western Himalaya plays key role in the sustenance of traditional mountain farming systems. Nevertheless, for various reasons such as growing human population coupled with unsustainable patterns of consumption, increasing production of wastes and pollutants, deforestation, developmental activities such as hydroelectric projects, road construction, and introduction of new cash crops, varieties and breeds throughout the region has proved detrimental to the native genetic resources and resulted into their wide spread loss. This is something we need to recognize and conservation priorities vis-à-vis strategies are required to be designed accordingly.

Physical features of the tribal regions of western Himalaya: The tribal areas of Western Himalaya mainly represent the cold arid region which lies in the western edge of Himalaya encompasses 30°64'- 37°20'N latitude and 72°30' - 80°15'E longitude. It is inhabited by indigenous tribal communities having Mongolian features, Buddhist religion and culture and has one of the lowest population densities in the world (3 persons per sq. km). This region is characterized by extremes of climatic conditions such as subzero temperature (up to -45°C in Drass) with a great diurnal fluctuation (difference of up to 40°C), scanty rainfall (<100 mm), speedy afternoon winds (40-60 kmph), heavy influx of infra red and ultraviolet radiations and very low relative humidity (25-50%). Soils are extremely barren with low organic matter (1.17 %), loose texture, low level of nutrients except potassium, and high pH (7-11). High aridity and low temperatures lead to sparse vegetation and poor biological activities because of which the landscape is desert-like with sand dunes and even occasional sand storms occur. The flora and fauna here has different features adapted to such cold arid environments.

Plant Genetic Resources: The Western Himalaya is comparatively drier thus characterized by drought resistant and cold loving plants. The mountains here exhibit a wide altitudinal range starting from the valleys to the highest limits of alpine vegetation (6000 to 6500 m). The region harbour both cultivated and wild diversity in *Pyrus, Prunus, Sorbus, Ribes, Rubus, Hordeum, Elymus, Eremopyrum, Avena, Aegilops, Allium, Vicia, Lepidium, Carum, Bunium, Linum,* and *Cicer.* The rich genetic variability occur in food crops like winter wheat, cold tolerant paddy (red grained, *Japonica* types), barley (both husked and naked), buckwheat, amaranth, chenopods, and minor millets. The landraces of wheat grown in Lahual – Spiti and Ladakh also exhibit variation. The wheat crops are usually a mixed stand of several morpho-types. Sparse populations of winter wheat can also encountered in Pangi and Lahaul valleys. Barley exhibits tremendous genetic diversity in its ear attributes of naked and husked types. Interestingly black grain type landraces occur at high (3000 m & above) altitude in Ladakh (J & K) and Lahual-Spiti, Kinnaur, Pangi (Chamba) in Himachal Pradesh and in Garhwal Himalayan region of Uttarakhand. Both two and six rowed ear heads are found in *Hordeum vulgare* fields as well as occasional occurrence of wild *Hordeum spontaneum* types (black brittle awn types) can also be encountered in the field populations.

The genetic diversity is also distinctly high in introduced crops like maize and kidney bean and soybean locally known as *bhatt.* This has been due to ecological differentiation and natural selection combined with time-to-time introduction owing to their nutritional value and preferential uses. The tribal region of Chamba, Doda and Kistwar are famous for growing large number of local types of maize such as safed, peeli and gajri kukdi, which command premium price for their taste and cooking quality. Another landrace *chitkanoo* grown in Chamba has excellent popping quality while murli maize grown in the interiors of Jaunsar and Bhavar region of Uttarakhand is prolific bearer and has excellent taste. Rajmah cultivated at higher elevations have distinctly high genetic diversity for seed colour, seed size and taste. Its red colored small seeded and long capsule shaped ecotypes grown in Chamba, Kinnaur, Rajouri, Bhaderwah, areas are popular for their taste and cooking quality. In high altitude even the scarlet runner beans (*Phaseolus coccineus)* has gained much popularity. The local landraces of *Pisum sativum* var. *arvense* have useful variability and in general have disease resistance particularly powdery mildew and cold tolerance. The ethnic communities in Kinnaur, Spiti, Pangi and Bharmour in Chamba and Ladakh mainly grow these.

The important sources of edible oil for hill communities include *Prunus armeniaca* (chuli), *Juglans regia* (akhrot) and *Aesandra butyraceu* (Cheura). Vegetables and wild edible plant species are invariably grown by the tribal communities in their backyard and also harvested from wild. In case of forage legumes, the diversity is extensive and the same is being expanded by natural hybridization. The extent of diversity found in natural populations of *Medicago sativa* and *M. falcata* in Ladakh and Spiti is a classical example of natural variations. Among fruits, *Prunus mira (behmi)* grows in extremely cold areas and used extensively for making brew and as rootstock for *Prunus* species. The preponderance particularly of the drier types of apricot (*Prunus armeniaca*) is also high in the arid region. Two of its variant viz. red-fruited and white-fruited is widely grown in Kinnaur and Leh areas. Its kernel is sweet in taste hence used as adulterant in almond kernels. Walnut (*Juglans regia*), almond (*Prunus dulcis*) and hazel nut (*Corylus colurna*) are important nuts for which varietal diversity is occurring in the region. Many species of *Rubus*, *Ribes* and *Rosa* are harvested from wild for their edible fruits.

The region has unique advantage for having genetic diversity of high value speciality crops/monopoly crops such as saffron (*Crocus sativus*), kala zira (*Bunium persicum*, *Carum carvi*), wild *Allium* species, chilgoza (*Pinus gerardiana*), charma, sea buckthorn (*Hippophae rhamnoides*) etc. These crops are of potential economic value to the local communities. This region is also a potential source of many essential oils yielding and temperate medicinal plants such as *Aconitum species, Nardostachys grandiflora, Dactylorhiza hatagirea, Picrorhiza kurrooa, Rheum australe, Ephedra gerardiana, Hyoscyamus niger, Podophyllum hexandrum, Saussurea lappa, Arnebia benthamii, Gentiana kurroo* etc.

Besides, there are large numbers of wild relatives of crops that contains genes for various purposes such as quality, biotic and abiotic stresses. For instance, *Cicer microphyllum* growing in harsh climate of Ladakh and Spiti have genes for cold and drought tolerance, longer pod length and large number of seeds/pod while *Pisum sativum* var. *arvense* have useful variability for powdery mildew resistance. *Linum perenne* is the only wild relative of linseed occurring here has tolerance to cold and drought. *Malus baccata* in apple; *Pyrus pashia* and *P. pyrifolia* in pear; *Prunus cerasoides* in cherry and *P. mira* in peach are used as rootstocks with multiple disease and insect resistance and drought tolerance. *Malus baccata* has shown resistance to collar rot, root rot and woolly aphis and tolerance to drought in apple while *Pyrus pyrifolia* and *P. pashia* showed resistance to powdery mildew and root rot in pear. The wild relatives of *Allium* such as *A. schoenoprasum, A. carolinianum, A. tuberosum, A. consanguineum, A. humile, A. przewalskianum, A. stolczkii, A. stracheyi, A. victorialis* and A. *wallichii* occurring mainly only in cold arid region have great breeding potential.

Animal Genetic Resources: The north-western Himalayan region of India is a repository of rich biodiversity among the domesticated animal resources. Not only the region has large livestock population, but also possesses rare species and breeds with unique characteristics and economic utility in the hill farming systems. The animal genetic resources of the region are represented by a broad spectrum of native breeds/ types of the cattle (hill cattle), sheep, goats, equines, yak, double-humped camel and pet animals. These breeds have evolved as a result of natural selection and / or human intervention (through need based selection and mating plans) over a passage of time for adaptation to the native environment and economic utility in the production system. The peculiarities of these species include their adaptation to topography and climate, ability to thrive on scarce forage resources, traditional animal husbandry practices and yet sustaining the production at subsistence level.

The north most Kashmir zone has four distinct recognized breeds of sheep namely Bhakarwal, Poonchi, Karnah and Gurez. The animals are generally white, although colored fleeces are occasionally observed. Some animals are spotted fawn or grey. Rams are horned; ewes are polled. Gurez is the largest breed among the Kashmiri breeds in size. Most of these breeds have now been crossed with Merino for improving greasy-wool production and quality for apparel. The southern zone comprising areas of Himachal and Uttrakhand is home to two breeds, namely Gaddi and Rampur Bushair. The Gaddi is a predominant sheep breed of the region, highly adaptable to migratory production system and producing valuable apparel wool for domestic wool industry. The native tract of the breed is confined to the northern districts of Himachal Pradesh, but the animals are distributed up to Kinnaur towards the south of the state and adjoining areas of Jammu and Kashmir towards north. The Rampur Bushair sheep with its home tract in Rampur- Bushair sub division of Shimla district, is mostly maintained as migratory flocks extending to the districts of Kinnaur, Kullu, Solan and Chakrata hills of Uttarakhand. The animals are medium sized, usually white with dark tan or black coloration of face and body. Indiscriminate crossing of these breeds with exotic sheep for improvement over the years has led to drastic decline in the pure bred animals of these breeds.

Among goats, Gaddi is the most popular breed of temperate and sub temperate Himalayan region with its breeding tract confined to southern districts of H.P. The animals are distributed throughout the state and adjoining region of J&K in north and Uttarakhand in south. These goats constitute about three- fourth of total goat population of the state and are reared by approximately 35% traditional 'gaddi' families as migratory flocks on sub mountainous pastures during winter and high attitude alpine pastures during summer. The region has two pashmina breeds viz., Chegu and Chanthangi. Chegu breed is a native of Hangrang valley of Kinnaur district and Spiti area of Lahual & Spiti districts in H.P. The animals of similar phenotype are also distributed in Laddakh (J&K) and Chamoli and Pithoragarh (Uttarakhand) but called as 'Pashmina goats'. The current population of the goats of this breed is approx. 2500-3000 with best/ elite animals confined to Spiti areas. Changthangi is another pashmina goat breed of the area and is distributed over Changthang region of Ladakh, at altitudes above 4 000 m.

Spiti synonymous Chamurthi and Zanskari, the two equine breeds found in the tribal region, are among the six recognized breeds of horses in India. The Spiti animals are reputed for their sure footedness during high altitude migration. The breed resembles to the Tibetan breed of horses. The true breeding tract is confined to Pin valley of Spiti area having cold desert climate but are distributed, rather scarcely, to Kinnaur, Shimla, Kullu, Mandi and Kangra districts of HP and Ladhakh area of J&K. These horses are primarily reared for transport but are also used for riding and other related activities. The total population of Spiti horse is about 4000 with best animals found in Pin Valley.

The non-descript hill cattle are the primary population of cattle distributed throughout the north-western Himalayas. The animals are small to medium sized, mostly black in color, horned and uniform in appearance. Though low-yielding, these animals possess several peculiar traits like adaptation to harsh topography and climate, ability to thrive on scarce forage resources and resistance to several tropical diseases, which make them suited to hostile conditions of the mountainous areas. Yak (*Bos gruienus*) is another multi-purpose bovine species of high altitude regions in Kinnaur, Lahaul & Spiti and Chamba (Pangi sub division) districts of HP, Ladhakh and some north-eastern regions of India. The animal is usually found 2500 m above sea level and is best suited for cold desert temperate regions.

Though the hill cattle breeds are generally better adapted to withstand harsh climatic conditions and tropical diseases, their low productivity has reduced their importance in current production systems. Barring few specialized breeds, populations of many locally adapted breeds have declined with accompanying reduction in their genetic variability. Some of indigenous breeds are losing their purity and special traits due unplanned and indiscriminate crossbreeding and interbreeding with animals of the other type e.g. Yak-cattle and mithun-cattle crossbreeding in the Hindu Kush-Himalayan region. Several national and international agencies are making efforts towards conservation of rare and dwindling breeds of domestic animals and their genetic improvement to make them economically viable in the current production systems. Among the indigenous genetic resources of farm animals in HP, efforts have been initiated for characterization and conservation of certain unique breeds like Chegu goats, Spiti horses, Gaddi sheep and goats and hill cattle through various sponsored research schemes. Both *in situ* (maintenance of live animals' population of the breed in its natural habitat) as well as *ex situ* (conservation of germplasm away from its natural habitat usually as cryo-preservation of semen, ova or embryos) conservation strategies are being adopted to save these species for posterity.

Fish Genetic Resources: Western Himalayas covering Himachal, Kumaun-Gharhwal, north-east Kashmir and Himachal Pradesh is endowed with rich diversity of water resources such as snow fed perennial rivers (3000 kms), seasonal streams (775 kms), reservoirs (60000 ha) ponds, natural lakes and irrigational channels (2000 ha). The region has 270 fish species of which nearly 36 are endemic. The three most diverse of the 30 different families represented here are minnows and carps (Cyprinidae; 93 species and 11 endemics), river loaches (Balitoridae; 47 species and 14 endemics), and sisorid catfishes (Sisoridae; 34 species and four endemics).

Interestingly, the fish species distribution in the Himalayan streams depends on the flow rate, nature of substratum, water temperature and the availability of food. In torrential streams, the headwater zone inhabited by rheophilic species of loaches and catfishes (*Noemacheilus gracilis*, *N. stoliczkae* and *Glyptosternum reticulatum*); large stream zone formed by the joining of headwater streams, inhabited by *Diptychus maculatus* and *Noemacheilus* spp. whist in the most torrential reaches rheophilic species of the snow trout *Schizothoraichthys esocinus*, *S. progastus*, *Schizothorax richardsonii* and *Schizopygopsis stoliczkae* occur. The intermediate reaches of the large stream are frequented by *Schizothorax longipinnis*, *S. planifrons* and *S. micropogon*. The least rapid reaches are occupied by *Garra gotyla*, *Crossocheilus diplochilus*, *Labeo dero* and *L. dyocheilus*. On the other hand, slow moving water streams are inhabited by a large number of cold to eurythermal species such as *Barilius* spp., *Tor* spp. Catfishes (order Siluriformes), homalopterid fish (*Homaloptera* spp.) and snakeheads (*Channa* spp.).

The degradation of aquatic resources and environment are posing threat to the existing fish diversity. The harnessing of hydroelectric energy by damming of major Himalayan rivers and their tributaries, and other anthropogenic activities such as excessive water abstraction, soil erosion due to developmental activities, dumping of the waste in the streams and rivers and indiscriminate killings of cold water fishes by stupefying methods such as an addition of bleaching powder, dynamiting, passing of an electric current through aquatic environment are drastically destructing and changing the habitats of fish fauna with consequent negative impact on the diversity and abundance. Besides these, an introduction of exotic fish species viz., salmonids brown trout, rainbow trout, eastern brook trout (*Salvelinus fontinalis*), splake (hybrid between lake and brook trouts), and the land-locked variety of Atlantic salmon (*Salmo salar*) in the Himalayas from Europe, North America and Canada has led to decline of schizothoracine species due to brown trout preying upon their younger stages.

The fish species occurring in the region have been characterised on the basis of threat perceptions. For instance, *Tor putitora, Schizothorax richardsoni, Diptychus maculatus, Danio devario, Labeo dero, Labeo dyochielus* and *Noemacheilus kangrae* have been categorized as threatened species; *Noemacheilus botia, N. carletoni, N. corica, N. horai, Amblyceps mangois, Mystus vittatus, Glyptosternum reticulatum, Badis badis* as rare species and *Puntius chola, P. waageni, P. chilinoides, Tor tor, Tor mosal, Salmostoma bacaila, Acrossochielus hexagonolepis* as endangered species. The endangered *Tor putitora* (Golden Mahseer) and threatened *Schizothorax* (Snow trout) need immediate conservation measures. Certain broad based suggestions towards conservation of dwindling fish diversity of western Himalayas are: (i) There should be a strict check on stupefying methods of fish killing, (ii) environmental impact assessment studies need to be strengthened before the execution of hydro-electric projects, (iii) prohibition on fishing during close season should be strictly enforced. The people living around the streams, rivers, reservoirs and the commercial fishermen should be involved for enforcement of legislation, (iv) the high altitude lakes be stocked with the seeds of snow trout and mahseer to conserve their germplasm, (v) the *in-situ* and *ex-situ* conservation measures to protect the fish genetic resources be strengthened and (vi) conservation activities and awareness programs need to be organized in co-operation with NGO's and Angling association.

***Epilogue*:** The species occurring in the tribal region of Western Himalaya are unique in their features, thus need special conservation care. For instance, they are highly endemic, specialized and high valued; adapted to extreme environments and distributed with less individuals; majority species fall in rare and threatened category; highly sensitive to climate change and lack suitable corridors to shift upward, facing lot of replacement pressure from exotic species and have lot of socio-cultural and socio-economic significance. Therefore, conservation and use of such unique genetic resources will remain essential for improving productivity in agriculture and sustaining human existence in harsh environments of tribal regions. However, before developing appropriate conservation strategies, there is need to assess the status of existing plant, animal and fish species; their geographical distribution, demographic trends, present utilization pattern, threats involved; morphological, quantitative, and molecular characterization of commercially important species; promoting indigenous livestock breeding farms including specific support services in the native tracts for instance gujjar and gaddis; and most importantly people's participation in the conservation and value addition programmes.

There is need to promote *in situ* conservation of genetic resources in national parks, wet lands, gene sanctuaries and protect areas with complementary backups in the ex situ collection such as seed gene banks, *in vitro* storage, cryopreservation and field gene banks. Keeping in view the advancement in biotechnology and molecular marker technologies emphasis has also been laid on genomic resource conservation/ DNA banking. Other areas like awareness, training and enhancement of local skills in the management of genetic resources coupled with better market opportunities linking agro-ecotourism need to be looked into.

Further, it is always inappropriate to promote large-scale abandonment of biodiverse agriculture and to marginalize it in intensive production systems. The challenge is to create a new enabling environment that helps to the maintenance of genetic resources sustainable and reflect their true value to the livelihoods of people inhabiting such extreme environments. Building complementarities among agriculture, biodiversity and conservation of genetic resources will also require changes in agricultural research and development, land use, and breeding approaches being adopted in these areas. In addition, however, more radical changes are required that recognize biodiversity as a global public good, that integrate biodiversity conservation into policies and decision frameworks for resource production and consumption, and that focus on wider institutional and societal changes to enable more effective implementation of policy.

Integrated Farming System in Tribal Areas of Southern Rajasthan

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Features of Tribal Area in Rajasthan

- As per 2001 census there were 70.98 lakh tribal population in the state, which accounts for 12.4% of the total population of the state.
- Major tribal communities of the state are Bhil, Meena, Garasia, Saharia, Damor, etc.
- Tribal dominant districts are

(a) **South:** Banswara (71%) Dungarpur (65%), Udaipur (47.9%), Sirohi (24.8%), Chittorgarh (21.5%) Rajsamand (13.1%).
(b) South –Eastern: Baran (21.2%), Bundi (20.2%)
(c) North-Eastern: Dausa (36.8%), Karauli (22.4%) Sawai Madhopur (21.6%)

Futures of Tribal Households in Southern Rajasthan

- Most of the tribal households fall in the category of Marginal Farms (< 1ha)
- Literacy level is very low. Hence tribal workforce are engaged either on land based activities or on wage work. Young generation go to school. Some drop out after primary schooling in the village. Others go to high school and colleges at far away places.
- Due to lack of labour work, workforce move either to urban areas or to neighboring states like Gujarat, Madhya Pradesh and also to Mumbai (Maharastra).
- In MGNREGA mostly women folk take up unskilled labour work in nearby locations.
- Tribal families mostly live in "Kacha" houses and do not posses modern anilities like TV, Fridge, etc. Majority of the youth will have a cycle and mobile phone. Those engaged in non-agricultural skilled work like painting, massonary work. etc own motor bike also.
- Education level of male is more than that of female.
- The new generations having higher education are getting shifted to service sector for employment.
- The tribal farmers of southern Rajasthan follow farming systems with following components.

Crop: Maize, Urad, Gram, Wheat (wheat is grown only by those having sources of irrigation)
Livestock: Bullock pair, cow, goat, buffalo, poultry (back yard.)

MPUAT Interventions through Improved Integrated Farming Systems

1. Integrated Village Development Project

An innovative Integrated Village Development Project with integrated farming system approach has been implemented with the goal of transformation of villages for socio-economic upliftment of tribals of southern Rajasthan. The project was funded by Deptt. of Tribal Area Development, GOR . A basket of 18-28 technologies have been taken to 18 tribal villages of three districts viz. Banswara, Dungarpur and Udaipur. Under this project, apart from field crops and livestock horticultural crops were also introduced through Frontline Demonstrations.

- Tribal farmers realized **additional income due to seed replacement alone** to the tune of Rs. 2790/- per ha from improved maize, Rs. 2310/- per ha from sesamum, Rs. 5840/- per ha from wheat, Rs. 7200/- per ha from gram and Rs. 5340/-per ha from mustard.
- In all 291 new orchards of mango and aonla covering an area of 28.85 ha were developed on farmers field, plants have started bearing fruits.
- A massive programme of Ber budding was taken up with participation of tribal youth and 13050 deshi ber plants were budded with improved varieties, viz., Seb, Umran and Gola. These plants are performing very well and tribal households earn extra income after household consumption.
- Vegetable crops like onion, garlic, tomato, brinjal, okra, chilli, cabbage & cauliflower were introduced through 625 FLD's covering 62.5 ha area. Adopted farmers could earn income to the tune of Rs. 5000-16000/- just from 0.1 ha area.
- Tuber crops like turmeric, ginger, sweet potato and yam were introduced through FLD's. As a result area under these crops is picking up in the tribal belt.
- As a result of introduction of Sirohi goats in 421 tribal families the milk production and milk consumption has doubled and also the extra income by selling the milk to the tune of Rs. 300-400/- per month.
- As a result of success story of introduction of Sirohi goats, the breed improvement of local goat with Sirohi breed was taken up on the large scale on the demand of farmers.
- Free range poultry keeping in tribal area was improved with high productive Nirbheek breed, which resulted in additional income of Rs. 1000-2000/- per household by selling eggs & cocks.

As a result of these interventions not only the the existing farming system with crop – livestock components was enlarged to crop- livestock-horticulture, but also the household income, employment and nutritional status were enhanced.

2. NAIP on Livelihood & Nutritional Security in Tribal Area

The Directorate of Extension Education is the Lead Centre of NAIP Project "Livelihood and Nutritional Security of Tribal Dominated Areas through Integrated Farming System and Technology Models" being operated in a consortia mode in four most backward districts of the state i.e. Banswara, Dungarpur, Udaipur and Sirohi. Along with MPUAT, seven other ICAR and NGO's are collaborating for the conduct of this programme. In the project two models namely Horticulture based integrated farming system and livestock based IFS with judicious mix of proven and need assessed technologies appropriate for small and marginal farmers covering production to marketing activities have been planned and are being executed in 78 villages covering 13200 farm households for development of appropriate replicable models. Some of the encouraging results are as under –

- **Seed Replacement in Maize** – This intervention also made dent in doubling the productivity of maize by hybrid seed. Now, Govt. of Rajasthan provided hybrid seeds of maize to all the tribal families (7 lakh) in Rajasthan under Golden Rays Programmes and due to higher productivity from maize hybrids, this intervention is going to sustain.
- **Vegetable Cultivation** – This intervention alone has not only made significant impact on livelihood of the family but also brought social transformation. Looking to the success of this intervention, more farmers adopted hybrid vegetable cultivation and diversified their agriculture. Farmers earned maximum from Okra in zaid followed by Chilli cultivation. Okra was taken in 142 ha area with 912 families and paid dividend of Rs. 140 lac alone. Chilli was taken in 84 ha and on an average each family earned Rs. 23000/- from 0.2 ha land. Looking to the success ITC signed MoU for Chilli cultivation and procurement in Banswara and Dungarpur districts.

- **Pipe Irrigation** – This intervention has long lasting impact. In the operational area 310830 m quick connect pipes were provided to 3036 farmers. This intervention led to diversification towards vegetable cultivation as well as more area brought under irrigated crops. Looking to the success of this intervention, more farmers are demanding pipes.
- **Sirohi bucks for breed improvement** - In the project area 194 bucks were provided and 136 goat units of Sirohi breed provided. Due to this intervention 7600 progenies are visible and in coming years Sirohi breed of goats will visible in the project area. Farmers are getting higher returns from sale of male progenies and also getting higher milk production.
- **Nirbheek Backyard Poultry** – This intervention is very remunerative for landless and marginal farmers. Availability of chicks of this bird on regular basis is hindrance in sustaining the activity. However, efforts are being made to developing mini hatcheries in villages itself for regular supply of chicks.
- **Mangers** – This also has long lasting impact. Due to this intervention 25-30 per cent fodder can be saved. This intervention is very beneficial for the state like Rajasthan.
- The household level derived economic benefits by the beneficiary farmers in a selected village is summarized below-

Village : Masotiya No. of families : 290 No. of adopted families : 290

Category	Intervention	No.	Existing income (Rs.)	Present Income (Rs.)
Marginal	Seed Replacement (SR)	60	8500	12993
	SR + Horticulture	5	6660	16720
	SR + Livestock	73	10068	16118
	SR +Horticulture + Livestock	25	11216	25840
Small	Seed Replacement (SR)	21	16495	25319
	SR + Horticulture	-	-	-
	SR + Livestock	27	16662	28010
	SR +Horticulture + Livestock	13	18130	39002
Medium	Seed Replacement (SR)	16	28150	46406
	SR + Horticulture	1	30500	51500
	SR + Livestock	29	30224	43089
	SR +Horticulture + Livestock	11	30645	61102
Semi-medium	Seed Replacement (SR)	1	75000	103000
	SR + Horticulture	1	60000	95850
	SR + Livestock	2	57500	90912
	SR +Horticulture + Livestock	5	72200	123020

In short, while making interventions in tribal area the social system and cultural background of the people will have to be considered and improvement in existing farming systems were found more feasible than introduction of any new farming systems as tribal farmers are more sensitive to food and fodder requirements.

List of participants of the IAUA Annual Vice Chancellors Convention & National Symposium on "Tribal Areas Development", OUAT, Bhubaneswar, 7 - 8 December, 2010

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2.	**Sanjay Philip Das**	Administrative Secretary to VC, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad – 211 007 (U.P.)
3.	**Prof. (Dr.) V. S Tomar**	Vice Chancellor, Raj mata Vijyaraje Scindia Krishi Vishwa Vidyalaya, Gwalior – 474002 (M. P)
4.	**Prof. C. S. Chakrabarti**	Vice Chancellor, West Bengal University of Animal and Fishery Sciences Kolkata – 700 037 (W.B)
5.	**Dr. K. Narayana Gowda**	Vice Chancellor, University of Agricultural Sciences, Bangalore – 560 065
6.	**Dr. P. Murrugesa Boopathi**	Vice Chancellor, Tamil Nadu Agricultural University Coimbatore – 641 003 (T.N)
7.	**Dr. A. Chandrasekaran,**	Controller of Examinations Tamil Nadu Agricultural University Coimbatore – 641 003 (T.N)
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12.	**Dr. K.R. Dhiman**	Vice Chancellor, Dr Y. S. Parmar University of Horticulture & Forestry Nauni, Solan–173 230 (H.P.)
13.	**Dr. B. Mishra**	Vice Chancellor, Sher-e-Kashmir University of Agril. Sc. & Technology (J), Jammu TAWI (J&K) – 180 012
14.	**Dr. A. B. Patil,**	Registrar and Nodal Officer (IAUA) University Horticultural Sciences, Bagalkot- 587 102 (Karnataka)

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16.	**Dr. B. V. Venkateshaiah**	Director of Instructions (PG), Karnataka Veterinary Animal & Fisheries Sciences University, Bidar – 585 401 (Karnataka)
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19.	**Dr. R. C. Maheshwari**	Vice Chancellor, SKDAU, Sardar Krushinagar –385 506 (Gujarat)
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21	**Dr. V. Prabhakar Rao**	Vice Chancellor, SVVU, Tirupati – 517 502 (AP)
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29.	**Dr. Kirti Singh**	Chairperson, World Noni Research Foundation, Ex-Chairman, ASRB
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31.	**Dr. M. M. Panda**	Dean of Research, OUAT & Organizing Secretary
32.	**Dr. N. C. Mishra**	Director, Planning, Monitoring & Evaluation, OUAT and Coordinator

ACKNOWLEDGEMENT

The financial support extended by the Indian Agricultural Universities Association (IAUA), New Delhi and the Orissa University of Agriculture & Technology (OUAT), Bhubaneswar for organising the Vice Chancellors Annual Convention of Indian Agricultural Universities Association & National Symposium on "Tribal Area Development" at the Orissa University of Agriculture & Technology (OUAT), Bhubaneswar on 7-8, December, 2010 is acknowledged herewith.

Sd/- M.M. Panda
Organising Secretary,
& Dean of Research,
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Bhubaneswar
8 December, 2010