INTERIM REPORT OF THE PROJECT TO STRENGTHEN AN INDIGENOUS BASIS FOR FOOD AND LIVELIHOOD SECURITY IN RURAL AND TRIBAL AREAS

The following are the details of the project being carried out in four districts, two each in the states of Jharkhand and Bihar. A total of 120villages in the four districts constitute the area where the project activities are being conducted. The project period began on 15 December 2002. There were no activities From December 2002 till May 2003. Activities started in May 2003 after the first instalment of the grant was received.

The Project Focus areas are

Awareness generation
Strengthening food security on the basis of indigenous crop varieties and systems
Indigenous health & veterinary care
Income generation from bio-resources
Training and capacity building

Project Activities include

Awareness generation about the

- Economic value and importance of indigenous knowledge
- Rights over bio-resources
- Importance of sustainability in agriculture

Agriculture

- Documentation of IK pertaining to agriculture.
- Collection and characterization of indigenous varieties of rice, legumes and vegetables.
- Organization of village level *seed banks and grain banks.*
- Collection, characterisation and conservation of traditional varieties in farmer level gene banks.
- Multiplication of traditional varieties to provide a viable seed source for farmers.

Indigenous Health & Veterinary Care

- Documentation of IK pertaining to traditional healing/ medicinal plants.
- Establish herbal gardens of local flora and other medicinal plants important for health and veterinary care.
- Work towards reviving interest in traditional healing for health and veterinary care.
- Work to develop herbal database of IK that has legal protection, where the ownership will belong to communities. Access to the database would be made available for a fee and according to the principles of the CBD (prior informed consent and material / information transfer agreements).

- Public education and motivation building exercise specially among women and youth about the growing market for herbal products, their opportunities for tapping this market and the importance of conserving IK relevant to this field.

Income Generation from Bioresources

- Adding Value to Forest Produce & trying to create markets
- Provide training to tribal men and women in cleaning, sorting and grading collections of forest produce.
- Provide training in first and second degree processing and storage of forest produce to increase shelf life.
- Increase incomes by adding value locally to raw collections.
- Explore marketing outlets for herbal products.
- Explore cultivation of medicinal plants
- Conduct an awareness exercise about the value of cultivating medicinal plants. Explore the ground for possible cultivation of medicinal plants if there is local interest.
- Explore the possibility of industry tie-ups to ensure markets if cultivation of medicinal plants is feasible.

Training & Capacity Building

- Provide training to civil society groups and organizations on developing an indigenous and sustainable basis for food and livelihood security.
- Build capacity locally by training *adivasi* volunteers so that they become trainers themselves and can extend the work.
- Train farm men and women to set up seed banks and local 'gene banks' of traditional varieties.
- Train local people to set up grain banks for self-help in lean times and to reduce dependence on the moneylender.
- Provide training in sustainable harvesting of forest produce like medicinal or other useful plants so that the required plant part is harvested in a way that does not threaten the survival of the plant.
- Provide training in processing and adding value to forest produce.

Producing Information Materials and quarterly newsletter

PROJECT AREA

Two districts each in the states of Jharkhand and Bihar have been selected and thirty villages per district (i.e. total of 120 villages) are the project areas. The districts selected from Jharkhand are Ranchi and Hazaribagh and from Bihar are Nawada and Nalanda. The required details of the two states, selected districts, blocks and identified villages are given below.

I. District Ranchi

S. No.	Blocks	Identified Villages
1.	**Ratu**	Bijulia-Mariatu, Jamuntoli, Bhonda-Garri, Kota-Hetha, Guru, Buchidari-Gariatoli, Hisri-Bajpur, Hururi, Malmaru, Patratoli.
2.	**Mandar**	Kanjia, Burhakhokra, Karkara, Phungi, Katchachu.
3.	**Bero**	Gargaon, Palma, Chachgura, Kulli, Bhandra.
4.	**Karra**	Lodhma, Chandapar, Murhu, Kachchabari, Bindgaon
5.	**Ormanjhi**	Kamta, Bajarmara, Barbe, Rigatoli, Kulhi

II. District Hazaribagh

S. No.	Blocks	Identified Villages
1.	**Ichak**	Mahuri, Jarza, Simradhap, Gangara, Turi, Dihi, Belmakka, Devkuli, Puranpania, Garidih, Darigadhar, Phoophandi, Parasi, Khutra, Gardua
2.	**Katkamsandi**	Boragara, Nachly, Hatkona, Gurudih, Perwatari, Kajwatar, Patiatari, Barkakaran, Khelari, Hardiatanr, Naina, Dohar, Gundhatari, Diwalbodh, Bajhapar Nadi
3.	**Vishnugarh**	Only Vishnugarh

III. District Nawada

S. No.	Blocks	Identified Villages
1.	**Roh**	Rupow, Bhikampur, Benipur, Ajay Nagar, Dhanawan, Telari, Kasmara, Chhanaun, Sadikpur, Mahuli
2.	**Kawakol**	Mahulia Tanr, Jharnama, Ranigadar, Nahudar, Daniyan, Mananpur, Lalpur, Madhurapur, Rupabel, Guthiya
3.	**Pakribarawan**	Budhauli, Koiria Bigha, Kawla, Aitari, Asma, Diaura, Vishanpur, Bhalua, Hasna

IV. District Nalanda

S. No.	Blocks	Identified Villages
1.	**Giriyak**	Kerua, Lakhachak, Bishunpur, Ranisarai, Durgapur, Mahila, Adampur, Satwa, Kandupur, Raitar
2.	**Silao**	Mohanpur, Kapatia, Karahdih, Niyamat Nagar, Raghubigha, Junaidi
3.	**Rajgir**	Majhanpur, Baraitha, Chorsua

JHARKHAND

The geographical poition of Jharkhand is 21 degree 58 minute to 28 degree 18 minute North and 83 degree 22 minute to 87 degree 57 minute East. The geographical boundary of the state is North Bihar, South Orissa, East West Bengal, West Chhattisgarh and Uttar Pradesh. The length and width of the state from East to West is 463 km and from North to South is 380 km.

The mineral rich Chhotanagpur plateau accounts for over 41% of the country's total mineral production.

The main tribes include, Santhal, Munda, Oroan, Ho, Khariya, Baiga, Bhatudih, Bedia, Bhumiz, Binjhiya, Chero, Chick, Badaik, Gond, Gorail, Karmali, Kharwar, Khand, Kisan, Kora, Lohra, Mahil. The minor tribes include, Asur, Birhor, Virajiya, Pahariya, Mal Pahariya, Sauriya Pahariya, Hill- Khariya, Sabar and Korwa.

The languages spoken by the tribal and non-tribal communities of the state are Santhali, Mundari, Kudukh, Khortha, Nagpuri, Sadri, Khadiya, Panch-parniya, Ho, Malto, Karmali, Hindi, Urdu and Bangla.

The main festivals of the tribal communities, which are mostly related to the agriculture or biodiversity, are Sarhul and Karma. Agriculture is one of the main sources of income for the people of the State. Jharkhand has a fertile soil and receives abundant rainfall, which is lost due to its undulating topography. The main crops grown by the farmers of the State are Paddy, Maize, Millets, *Til*, different vegetables and fruits. There is also a large scope of producing Jute, Hemp and other fabrics to boost the State Economy. There is also a large potential of Tea cultivation, Floriculture, vegetables and fruits in the State for export.

Jharkhand is covered by vast stretches of thick *jungles*, which occupies over 29.77% of total land area of the State. Most of the forests are in Hazaribagh, Palamu, Giridih and West nghbhum districts. Valuable forest products such as Mahua Seeds, Sal Seeds, Shellac, Bamboo, Kendu Leaf, Harra, Tussar Silk etc are available in abundance.

BIHAR

Bihar is situated in the Eastern part of India, lies between 21 Degree 58' to 27 Degree 31' North Latitude and 83 Degree 19' to 88 Degree 17' East longitude. The State is touches eastern part of India with the Himalayan Kingdom of Nepal to its north and states of Orissa, West Bengal, Uttar Pradesh and Madhya Pradesh flanking its side.

Bihar covers 5.29% (1,73,877 sq. kms.) of the country's area. Bihar with Jharkhand can be broadly divided into two physiographic units, the Plains and the Plateau. The topographic units are mainly plain in the north, sloping towards the South East with big rivers like Ganges, Gandak, Kosi, flowing through it. South of the plains is the Plateau Region with rivers like Damodar and Swarnarekha. Bihar and Jharkhan are endowed with minerals, fertile green fields, peaceful labour force, vast market and a political system committed to industrial growth. Bihar is the home of 90 million Indians, the second most populous in the country.

Agriculture contributes 47.6% to the state domestic product. The pre-dominance of agricultural activity is further evident from the fact that 87.52% of Bihar's population resides in the villages. The agriculture sector provides livelihood for over 80% of its people and important segments of industries derive their raw material from agriculture produce like jute, sugar and small or village industries such as oil mills, dal (pulses) mills etc.

Agriculture therefore, requires prime concern from time government for all round economical development of Bihar. Agricultural economy in Bihar is characterized by predominance of food crops and the existence of large number of small and marginal farmers. Agriculture is faced with major challenges like low yield per hector, regional disparities, low diversification of agriculture growth and declining capital formation in agriculture. The state is starving towards an action-oriented policy for rejuvenating its agriculture sector. Dynamic agriculture development strategies need to be defined to remove the existing deficiencies.

PROJECT START

The project activities started in May 2003 after the receipt of the first instalment of support from Ford Foundation on April 29. 2003, although some contact work had begun before that. Gene Campaign has built upon the initial work it had done in several states, including Bihar which at that time included Jharkhand. This period of awareness generation work was related to food and livelihood security concerns, specifically the concerns emanating from the GATT/WTO and the intellectual property regimes (IPR). Because of this phase of work, we had some contacts and some familiarity with Bihar and Jharkhand.

The first phase of the current project started in Jharkhand and was followed by the work in Bihar. The initial phase of the work was familiarisation and contact visits to understand the resources of the region, identify the specific villages where we would work and make local contacts for implementing the project. An important goal of these visits was to establish contact with the local people which included the adivasi and village communities, as also the local elite, local politicians, members of government, academic and other institutions and other civil society groups. During meetings with these various groups of people, we explained in a clear, straightforward way what we were trying to do, and why. We tried to answer questions clearly and provided information they asked for, specially the government.

A lot of time was spent in villages, holding meetings mediated by local contacts, to engage in a consultative process with the elders in the community and seek their suggestions for project implementation and for final selection of villages. Through this consultative process and by approaching the local community and the farmers as partners in the work we were trying to do, it was possible to enlist cooperation and support and break down the initial reserve, to quite an extent. This is reflected in the help we get in project implementation and the corrective critique we receive from time to time. It was because of this confidence building exercise that it has been possible to document indigenous knowledge at a time when most local people are suspicious of telling outsiders anything about their traditional practices. It has also been reflected in the way that we have been able to set up herbal gardens of medicinal plants on the private lands offered by the members of the local communities.

The areas we have selected in both Bihar and Jharkhand have sizeable Muslim populations and we have taken care to include them at all levels of the project . We are also preparing information literature in Urdu along with Hindi and Nagpuri, the most prevalent adivasi language in this region. We have tried always to have separate meetings with women when they were unable or unwilling to join the common meetings. The first meetings were also a useful exercise to get the youth involved. This was essential to help us to identify people to be recruited for the project, volunteers and potential trainers and to increase our outreach when we started to organise the communities and do the training. We have also been building up a list of local contacts from the community, from local academic institutions and from government, to serve as resource persons in training and other project activities.

DETAILED ASSESSMENT OF THE PROJECT AREA

A series of familiarization visits were undertaken to establish contacts with local people, understand the agro-climatic and physical features of the region, the natural resources, specifically the bioresources and agriculture, to develop the details of project implementation. These visits focused on details like:

i) To understand the biodiversity and natural resources of the area.
ii) To know about the sources of income of local people.
iii) To find out constraints to their economic development.
iv) To understand local agriculture -
- Cropping systems
- Cropping patterns
- Tradition of mono-cropping and multiple cropping systems
- Sowing and harvesting times
- Crop productivity
- Profitable crops that are prevalent in the area
- Prospects of increasing crop production

v) To study the use of chemical and bio-fertilizers, its cost and effects on crops and soil etc.
vi) To know about pest and pesticides.
vii) To understand the irrigation systems, water harvesting techniques and problems related to irrigation.
viii) To know about the nature of soil , soil types and soil related problems.
ix) To know about the seed quality, seed cost and hybrid variety of rice.
x) To know about the activities of extension workers.

ANALYSIS

Land: Out of the total geographical area of 79.70 lakh hectares, 27.4% is under forest and about 30% of the area have been brought under plough. A vast land surface forms barren and uncultivated lands. Land put to non-agricultural uses, grazing lands, current fallow and other fallow lands. The land surface is rugged and undulating, ranging from flat lands to almost steep slopes. Agriculturally the upland, also known as Tanr land, is classified into three groups as Tanr – 1, Tanr – 2, Tanr – 3, depending upon situation in slope, nearness from the homestead land and the productivity. Similarly the low land is classified into Don-1, Don-2 and Don-3. Number one is always the best land from the point of productivity, second and third categories medium and poor in production.

Soil: Upland soils are usually red and acidic (pH 5.5 – 5.9). These soils are lighter in texture and the water holding capacity is poor (30 – 35%). The medium land soils are yellowish and slightly acidic (pH 6.0 – 6.5) water holding capacity of the soil is considerable. The low land soils, on the other hand, is grayish and neutral or slightly alkaline (pH 7.0 – 7.3). The soils are heavier and water holding capacity is high.

The upland soils are low in organic matter and Nitrogen (0.04%), available Phosphate (0.002%), Calcium Oxoide(0.10%), Magnesium Oxide(0.25%) as against a fertile soil which should contain 0.2% Nitrogen, 0.02% Phosphate and 0.02% Potash. Due to the presence of high amount of iron oxides, the soils become very hard when dry. The soil gets very easily saturated (due to its texture) during rain but at the same time releases moisture is very fast with the result that soil moisture depletion occurs quite frequently and the upland crops have to face moisture stress and physiological dryness.

Soil improvement: Soil fertility may be increased by the use of organic manure such as Farmyard manure, Compost manure, Town compost, Sewage and sludge and Green manuring.

Farmyard manure – It is the most commonly used organic manure by the farmers of the plateau region. It consist of a mixture of cattle dung, the bedding used in stable and plant stalks fed to cattle. Collected cattle urine may be added to the dung in the manure pit. Nitrogen in urine is mainly in the form of urea which readily changes to ammonium carbonate through bacterial action.

Compost manure – Good organic manure similar in fertilizing value to that of cattle manure can be produced from waste material of various kinds such as cereal straws, crop stubbles, groundnut hull, farm weeds and grasses, leaves etc. These materials are high in carbon nitrogen ratio.

Green manuring - It is a practice to enrich soil by turning under indecomposable plant material (other than crop residues) usually from leguminous plant either in situ or brought from a distance. Green manuring can increase humus content of soil or supply of available nitrogen or can do both at the same time. Available nitrogen is increased only when readily decomposable materials are decomposed.

Forest: In the whole state of Bihar there are only 5050 Sq.km of reserved forests where the public or tribal have no rights. The rest 24,176 Sq.km are protected forests.

In these protected forests rights and concessions are granted to the local population as recorded rights and customary rights.

The forest of this area falls under the categories of Dry Peninsular Sal, Dry mixed deciduous and the Dry bamboo forest areas.

The important species of trees are Sal (*Shorea robusta*), Pipal (*Ficus religiosa*), Bakain (*Melia azedarach*), Bamboo (*Bambusa arundinacea*), Neem (*Azadirachta indica*), Amla (*Embelica officinalis*), Bahera (*Terminalia bellirica*), Harra (*Terminalia chebula*), Salai (*Boswellia serrata*), Rohini (*Mallotus philippensis*), Mahua (*Bassia latifolia*), Silk cotton tree (*Bombax pentandrum*), Indian laburnum (*Cassia fistula*), Sisham (*Dalbergia sissoo*), Gambhar (*Gmelina arborial*), Bhela (*Semecarpus anarcardium*), Asan (*Terminalia tometosa*), Khair (*Acacia catech*), Palas (*Butea monosperma*), Tamarind (*Tamarindus indica*), Bel (*Aegel marmelos*), Karjani (*Abrus precatorious*), Jamun *(Syzygium cumini*), Kusum (*Carthamus tinctorious*), Date Palm (*Phoenix dactilifera*), Sidh, Mango (*Mangifera indica*), Siris, Gular (*Ficus glomerata*), etc.

Rainfall: There are many areas in the plateau regions, where the rainfall is adequate during monsoon. More than 75 percent rain falls between July to August.

Season	**Rainfall (mm)**
1. Annual	1350 – 1400
2. Season (Jan.-Feb.)	20 – 30
3. Season (March-May)	20 – 50
4. Season (June-Sept.)	
June	200
July	360
Aug.	350
Sept.	220
5. Season (Oct. – Dec.)	
Oct	80
Nov.	20
Dec.	Least

Irrigation: The irrigation systems are not very developed in this region. Mostly rivers are seasonal, lake, canal and ponds are in very small number. Traditions of water harvesting systems are almost absent. The R.K.Mission has made some efforts in the field of irrigation in backward areas of Torpa and Rania blocks of Ranchi district.

There are only wells for the irrigation of agricultural lands. Due to the rocky plateau, bore wells are not very successful. In monsoon season farmers use stored rainwater for irrigation of uplands (tanr). Irrigation facilities are limited to only 7% area, the major *Rabi* cereal is grown as rainfed. This situation is likely to continue for a long time to come. The farmers, therefore, have to bank on rice, small millets and *Goda* (indigenous rice variety) for their existence and that is why at present rice and millet enjoy first and second position, respectively. Since most farmers of the red soil region come under small and marginal group, they do not have sufficient food reserve and reach the state of semi starvation during late summer and early rains i.e.; during May, June and July.

Crops Grown:

Crop (new strains)	Water requirement (mm)	Yield (kg/ha)	Productivity per mm of water (kg/ha)
Rice	1200	4,500	3.7
Sorghum	500	4,500	9.0
Bajra	500	4,500	8.0
Maize	625	5,000	8.0
Wheat	400	5,000	12.5

Crop Productivity: Productivity of crops varies in different blocks of Ranchi district. These variations are due to difference in Land, Soil, and Irrigation conditions. The range of productivity of crops of some agriculturally developed blocks is as follows.

Crops	**Productivity**
Kharif	
Rice	High
Millets	Moderate
Niger	Low
Maize	Low
Pigeon Pea	Low
Ginger	High
Cabbage Cauliflower	High
Other vegetables	High
	Low to Moderate
Rabi	
Wheat	Low
Mustard	Low
Linseed	Low
Pea	Moderate

- Productivity of indigenous and new rice varieties:

  70 to 100 mann* per acre** - Hybrid variety

  60 to 80 mann per acre - High yielding variety

  30 to 40 mann per acre - Indigenous variety

  *1 Mann = 40 kg

  **1 acre =100 decimal (in Ranchi)

- Productivity of wheat:

  20 quintal/ha. (Average)

Natural Resources: The main natural resources of the Jharkhand (Ranchi, Hazaribagh) region are forests, agricultural lands and minerals. Government workers and some local people have cut down a large number of forests. *Adivasi* and *non-adivasi* communities are fighting for the protection of forests but it is a difficult struggle to check deforestation. Local climatic conditions are getting disturbed due to rapid forest decline. Pesticides and fertilizers are also causing harm to the local ecosystem.

Economy of the Area: *Adivasi, non-adivasi* and farmers of this area are more or less dependent on agriculture. Their main source of income is only agricultural products. Some *adivasi people* collect non timber forest products such as fruits, fire wood and medicinal herbs and sell it in the weekly markets for additional income. Most of the *adivasi* have very little interest in agriculture; generally they work as a labour either in the field or in factories.

There are many constraints to their economic development; illiteracy is one of the main ones. Other constraints are poor irrigation, less fertile soils, pest and insect attacks on crops, high cost of fertilizers, pesticides, and seeds and lack of proper guidance in agriculture.

Agricultural Systems: The agricultural systems of the area are a mix of traditional and modern. Vegetable cultivation is traditional. The introduction of hybrid rice is displacing traditional rive varieties in many areas. According to their agro-climatic conditions the farmers of the area generally prefer monocropping system, very few farmers practices double or multiplecropping system. In Rabi season some farmers grow wheat with mustard, pea with linseed or pea with potato and bean as a double or mixed crops. The cropping pattern round a year of this area is divided into two seasons i.e. *Kharif and Rabi.*

Successful crops: *Rice, Ragi, Niger, Cabbage, Cauliflower, Pea, Ginger, Groundnut, Potato.*

Cropping pattern of the area is as follows:

Crops	Sowing Time	Harvesting Time	Productivity
Kharif			
Rice	June-July	Nov.- Dec.	High
Millets	June-July	Oct. – Nov.	Moderate
Niger	June-July	Nov. – Dec.	Low
Maize	June-July	Sep. – Oct.	Low
Pigeon Pea	July-August	Feb. – March	Low
Ginger	June-July	Oct. – March	High
Cabbage & Cauliflower	June-July	Sep. – Feb.	High
Other vegetables	June-July	Sep. – Feb.	Moderate
Rabi			
Wheat	Nov. – Dec.	March-April	Low
Mustard	Nov. – Dec.	End of March	Low
Linseed	Nov. – Dec.	End of March	Low
Pea	Oct. – Nov.	Jan. – Feb.	Moderate
Zaide			
Onion	Feb. -March	June-July	Low
Vegetables	Feb. - March	June-July	Moderate

More profitable crops are Rice, Ginger, Cauliflower, Cabbage, Peas and other vegetables. Farmers sell their crops to the middlemen from other states. Kolkata is the big city link. Due to lack of organisation and collection centres, middlemen and agents often exploit the farmers.

Fertilizers: Farmers use chemical fertilizers and organic manure in their fields. As chemical fertilizers farmers generally use Urea, Potash, Diammonium phosphate etc. Compost of cattle dung, biomass and leaves is also used. Birsa Agriculture University has started to offer training to do vermicomposting but this work needs to be expanded to more villages. This effective and ecofriendly compost is not in common use because of unavailability of earthworms.
Many problems have been created by chemical fertilizers like increased soil salinity, increased soil hardness, loss of important microorganisms and beneficial worms.

Pest & Pesticides: Pests and disease are a problem. A huge amount of standing crops are destroyed every year by these pathogens. Farmers identify the diseases through symptoms. Some local names of insects, which are identified by farmers, are as follows.

Rice – Bankey
Cauliflower – Pipli
Wheat – Dimak, Ratua

Important Insect Pests and strategies recommended by Birsa Agricultural University:

Crops	Symptoms	Insect Pests	Pesticides
Rice	White stripe on leaf	Rice hispa	BHC dusting @ 20-25 kg/ha
	Damage stem	Gall midge	Carbofuran granules @ 33kg/ha, Furadon
	White papery appearance of leaves	Case Worm	Kerosine oil, BHC dusting
	Hollow grain	Rice Gundi Bug	BHC 5% @ 30 kg/ha Endosulfan 1500 ml/ha
	Dead Heart and White Ear Head	Rice Stem Borer	BHC dusting
	Leaf is rolled like a mat	Rice Leaf Roller	Aldrine5% dust @ 30 kg/ha
	The whole plant is killed. Fields give the dry appearance.	Termites	Copper fungicide 0.35%
	Leaves originate as small specks and enlarged spots	Pyriculana oryzae (fungus)	Dithane Z-78 (0.2%) spraying
	Round to Oval spots and patches on leaves.	Helminthosporiu-m oryzae (fungus)	Kitazine, calixine
	Spot or lesion on leaf sheath, Greyish white brown margins.	Raizoctonia solani (fungus)	Seed treatment with Agrosan GN before sowing.
	Grains transformed into large, velvety, green masses.	Ustilaginoidea virens (fungus)	Soaking the seed for eight hours in Agrimycin
	Dull greenish water soaked or yellow margin to straw brown	Xanthomonas oryzae	

	large lesions.		

Recommended pest control schedule:

1. Ploughing soon after harvest and removal of stubble.
2. Weed hosts of major pests should be removed.
3. Digging out rat burrows and killing the rats in summer.
4. Use of resistant varieties should be done i.e. RD 202 for rice gall midge endemic area.
5. Setting up of light traps from the beginning of season to destroy moths and gall flies.

Wheat diseases:

1. Alternaria leaf blight
2. Loose smut of wheat
3. Brown Ratua disease

Maize diseases:

1. Leaf blight of maize
2. Banded leaf and sheath blight

Barley disease:

1. Strip of Barley

Millet diseases:

1. *Blast of Ragi* – Caused by *Pyricularia grisea* is the most prevalent and destructive disease. In order to find out a suitable chemical for the control of this disease the experiments were conducted at Kanke Centre. The result revealed that two spraying of Himosan (Ediphen Phos 0.1 percent), first at the time of earheaded emergence and second to be followed after 10 days gave good control of the disease and highest grains as well as fodder yield.

Oil crops diseases:

1. Tikka disease of groundnut
2. Alternaria leaf blight of mustard
3. White rust of Crucifer
4. Spot leaf blight of niger
5. Wilt of linseed
6. Rust of linseed
7. Alternaria leaf blight of linseed
8. Powdery mild of linseed

Quality and Cost of pesticides: Pesticides such as Endophillum, Dithen Z-78, Dalphine, Rogure, Endosil, Hostathion, Ekalux etc. which are generally used by farmers of this area are not found to be effective. Farmers claim that most pesticides are totally ineffective. This is probably because the pesticides sold are spurious. But they are very expensive. The price of Ekalux is Rs.100/100gm. Hostathione is Rs. 38/10gm., Endosil which is used for hybrid rice is particularly expensive at Rs. 100/50gm.

Account of the impact of agrochemical use: Farmers do not appear to be aware of the ill effects of excess pesticides on their health but they do say that the agriculture suffers.

i) Taste of fruits and vegetables is affected
ii) Nitrogen fixing microorganisms are being destroyed.
iii) Earthworms are being killed.
iv) Soil property is being degraded

Seed: Farmers generally use their own seeds for the next cropping season. They also buy hybrid and high yielding varieties of rice and pea seeds. Although the seeds that are bought from markets are costly, farmers are satisfied with the quality.

Rice seed –All three kinds of rice, traditional varieties, high yielding varieties and hybrid varieties are grown.
Goda rice is cultivated on only those areas or upper lands where irrigation facilities or water resources are almost negligible. Some old varieties of cultivated rice are *Kalamdani, Lal dhan, Karanga, Dahiya, Prasadbhog, Balamsai, Bachchakalam etc.*
High yielding varieties of rice are very popular among farmers. Productivity is higher. Major cultivated varieties of high yielding rice are IR-36, IR-64, Pant-4, Saryug-52 etc. Market rates of these seeds are around 400 to 500 per 50 kg.
Hybrid rice is gradually increasing in popularity among farmers. Although the seeds are very costly and it needs more water, more fertilizers and more pesticides, hybrid rice is being grown by some farmers due to three to four times more productivity than older varieties. Some examples of hybrid rice varieties are- APRH-1, APRH- 2, KRH-1, MGR- 1, CNHR -3, DRH- 3, KRH- 4. Name of some companies producing these varieties are PROAGRO, INDO-AMERICAN HYBRID SEED Co.(Bangalore),and MAHYCO (Maharashtra). Market rate of these hybrid seeds is Rs.100-200/kg. Its productivity is around 1.5 to 2 ton per hectare.

Other crops – Other crops grown by farmers are millets, maize, niger, mustard, pea, and vegetables. Good quality seeds are available. Farmers either preserve their own, or buy these seeds from markets or exchange with other farmers for next crop.

Seed production – Farmers and other local people are keen to produce good quality seeds of vegetables and other crops themselves but they need some help and economic supports as well as training for the work.

Genetic variability in fruits:

1. Custard Apple – *Red custard apple, Balanagar custard apple, Mimoth etc.* Other sub-species of custard apple are *Ramphal* (Bigger than other custard apples, more fleshy and contain very less number of seeds, not sweeter), *Cherimoya* (very good in taste and smell).
2. Jack Fruit- traditional name of best variety of Jack fruit is *Khaja*.
3. Jamun **–** Black plum (*Syzygium cumini*) is not very good in quality. Traditional names of two varieties are *Phalena* and *Kathjamun.* There productivity is good.
4. Bael **–** Local names of some good varieties of Bael are *Mirzpuri kagzi, Faizabadi Kagzi, Rampur kagzi, Ojha, Ajmati and Khamria.*
5. Amla **–** Some traditional names of Amla varieties are *Chakiya, Banarsi, Hathi jhool, Kanchan and Krishna.* Chakiya are the bets variety of Amla.
6. Karaunda - *White and Black.*
7. Lichi **–** *Shahi, China, Bedana, Laungia etc.*
8. Papaya **–** *Pusa dwarf, Pusa delicious and Pusa magistic* are growing successfully in Ranchi district.

Processing of Fruits and Vegetables:

1. *Papaya:* Processed into Jam, Pickles and Traditional medicines.

2. *Mushroom:* Mushrooms are processed into Pickles and Dried mushroom, etc. Fresh mushrooms are used as a vegetable.

3. *Amla:* Processed into Pickles, Traditional medicines.

4. *Mango:* Processed into Pickles, Jam.

5. *Guava:* Processed into Jam.

6. *Medicinal plants*: Processed into traditional medicines.

7. *Potato:* Processed into dried potato chips.

8. *Mixed pickles*: Chillies, Amla, Radish, Carrot, Cauliflower, Jackfruit, etc; mixed and processed into pickles.

9. *Tomato*: Processed into *chutney*.

10. *Custard Apple:* Processed into Powder.

Agricultural support systems:

Farmers are not happy with the agricultural support system or with extension workers. Ranchi is one of the 12 districts of Jharkhand, which comes under the jurisdiction of Birsa Agriculture University. Extension workers come from BAU to the few villages of Ratu and Mandar blocks. They give short-term training to the farmers and provide them seeds and pesticides. But the main purposes of these activities according to farmers are mostly related to their own research and experiments. Farmers do not follow all the advice given by extension workers. According to farmers, the advice given by these workers is not beneficial. They say the pesticides used by their own experience are more effective than the suggested pesticides and the same is true for cropping systems and fertilizers.

Potential for training local youth in agriculture:

We examined the potential for training local youth as extension workers since the official system seems to be unsatisfactory. Some boys and their parents (farmers) have great interest to get training in various agricultural fields, such as testing seed quality, nursery raising of rice and vegetable crops, pest control, repair of machinery etc. Farmers said they would be willing to pay trained boys who can provide service and trouble shooting.

Needs expressed by farmers

- Good irrigation systems, more access to water.
- Seeds of high yielding varieties on reasonable rates.
- Training in cultivation of vegetable and cash crops – Ginger, Turmeric, Mushroom, Pea, Cauliflower and Cabbage etc.
- Effective and low cost pesticides.
- Effective and low cost fertilizers.
- Income opportunities

Conclusions:

- There are three categories of lands, i.e. Upland, Medium land and low land.
- Uplands soils are usually red and acidic, medium lands soils are yellowish and slightly acidic and the soils of low lands are grayish, neutral to alkaline and highly fertile.
- Soils are poor in nitrogen, calcium, magnesium, phosphate and potash.
- Large parts of agricultural lands are barren.
- Economy is mainly based on agricultural products.
- There are only two cropping systems, Kharif and Rabi. Rice is the only crop of kharif season. Rabi crops are not well developed, except in some villages where pea, wheat, cabbage, cauliflower are grown.
- Ginger, Cabbage, Cauliflower, Pea, Potato are profitable vegetables.
- Usually farmers use chemical fertilizers, biofertilizers are not much in use.
- Farmers are not satisfied with the quality of pesticides available locally.
- Pesticides are degrading soil quality and reducing productivity.
- More than 75 percent rain falls during July-August.
- Irrigation is the main bottleneck in agriculture.
- Water harvesting systems are not established
- Farmers are generally satisfied with seed quality. They buy seeds either from markets or from each other.
- Seeds of high yielding varieties are expensive
- Farmers are ready to produce seeds of vegetables and fruits. But they need economic support and training.
- Farmers would like the village boys trained as extension workers because they do donot have faith in those that come from Birsa University.

ACTIVITIES

Awareness Generation

After the initial phase of the project, the first project activity was awareness generation among local people, civil society groups, students and youth and whoever was interested. The awareness generation programs took up issues like..

*Economic value and importance of indigenous knowledge, the linkage between this knowledge and the bioresources from which it is derived, the national and global developments in these fields, the social and economic importance of conserving this knowledge, the ways of reviving this knowledge for local health needs and in agriculture.

*Rights over bio-resources, the new legislation granting rights to farming and adivasi communities, fighting biopiracy through awareness, the source of the rights of the community to collect forest produce stemming from customary rights and the Constitution, the right of communities to stop collections by outsiders, the rights to save and sell their seed as before, the requirement of outsiders to take their permission (Prior Informed Consent) and their right to prevent outsiders from collection of bioresources, if they so wish.

*Importance of sustainability in agriculture, the need to reduce chemical use, the need for self reliance in agricultural inputs, supplementing natural manure with chemical fertiliser, reviving traditional methods of pest control and using pesticides with caution and restraint, the possibility of growing vegetables with low chemical inputs to be certified as ‘green agriculture’.

Awareness meetings were organised in villages, in the Gene Campaign office, in schools, with other groups in the city and at Kissan Melas. In villages, which were the main focus of these activities, simple literature and posters were used but most of the time was dedicated to discussions and questions and answers, so that people could dwell on issues they were not clear about. The project staff and the local youth would organise and conduct these meetings together with adivasi volunteers.

Over time, we were able to compile a list of volunteers to work with us on project activities and people who are potential trainers. The awareness programs also threw up many learning experiences for us and we attempted to incorporate these in our work. Most of these suggestions were about where it would be better to organise meetings and who else should be included. Out of the awareness meetings also came the beginnings of community organisation and awareness about the importance of collective action. Subsequent to these meetings, we began to develop self-help groups and to some extent, youth groups. The youth groups interact with the group of potential trainers more than with the others, this is probably because they belong to the same age group and engage in male bonding!

Community organisation- Gene Campaign project staff and volunteers, together with the potential trainers have been conducting Meetings and engaging in an exercise of Participatory Rural appraisal (PRA) in select villages. Awareness generation on various issues goes alongside these activities. Organising the community to develop self-reliance in dealing with problems, developing the confidence to raise issues of concern to them and engaging in activities to try to solve some of their problems have been the main goals. This has happened easier through women who have a greater interest and stake in development that will help to improve their surroundings and the situation for their families.

Gene Campaign has formed *Mahila* and *Yuva* self help groups in the villages. Most of them also work on project activities as well, gathering general information from villages as well as from blocks. Some of the SHGs now have their own bank accounts. They have been trained to organise weekly meetings where they discuss their social and agricultural problems and try to help each other find solutions. They also approach Gene Campaign staff or local officials for help. There are plans to start some village level income generation activities. It is hoped that the SHGs will be able to get loans from National Banks for their income generation activities and could benefit from the various schemes offered by NABARD.

All project activities; including awareness meetings were first started in Jharkhand and then in Bihar. In the coming phase more concentration of work will take place in Bihar. Ranchi is where the main Gene Campaign office is situated as well as the resource centre. Another office has been set up in Nawada but the main centre will remain in Ranchi. Part of the reason is the fact that what little support we are able to get from the government, is in Jharkhand. Getting any cooperation from the Bihar officials is very difficult and the growing caste based violence creates its own problems.

Training Workshops

One training workshop was organised in village Rupow in Nawada and another in village Bhonda in Ranchi. The workshops were interactive and were attended by about 450 people in Ranchi and about 150 people in Nawada.

The wokshops dealt with policy issues which included national and international developments related to agriculture , domestic legislation and policy related to bioresources and agriculture and the importance of legally protecting indigenous knowledge. The issues relating to food and livelihood security & income generation were covered. The training tried to develop an understanding of national and international developments like the WTO/TRIPS, the CBD, the status of the global trade in herbal products, and the opportunities presented by it, the formal rights of local communities and the value of bioresources, the need for conservation to ensure sustainable incomes.

* Economic value and importance of indigenous knowledge, the linkage between this knowledge and the bioresources from which it is derived, the national and global developments in these fields, the social and economic importance of conserving this knowledge, the ways of reviving this knowledge for local health needs and in agriculture.

* Rights over bio-resources, the new legislation granting rights to farming and adivasi communities, fighting biopiracy through awareness, the source of the rights of the community to collect forest produce stemming from customary rights and the Constitution, the right of communities to stop collections by outsiders, the rights to save and sell their seed as before, the requirement of outsiders to take their permission (Prior Informed Consent) and their right to prevent outsiders from collection of bioresources, if they so wish.

* Importance of sustainability in agriculture, the need to reduce chemical use, the need for self reliance in agricultural inputs, supplementing natural manure with chemical fertiliser, reviving traditional methods of pest control and using pesticides with caution and restraint, the possibility of growing vegetables with low chemical inputs to be certified as 'green agriculture'.

* Conservation of bioresources and indigenous knowledge associated with it.

* Training in seed & grain banks. Training was given to reduce seed moisture for long term storage, storage in dry, airtight containers under low light conditions, testing for viability and germination; catalogued & labelled storage of seeds for easy and reliable access, documentation and record keeping for grain and seed loans and returns.

Establishing Rice Gene Banks and Grain Banks

Over fifty traditional varieties of rice have been collected, characterised and processed for medium term storage in farmer level gene banks. Collections are continuing and seeds will be added to the gene bank from time to time. The gene bank, to be operated by farmers is being built in Mandar in Ranchi district.

Grain banks.

The project had envisaged setting up of grain banks for helping rural families in distress, to break their dependence on local moneylenders when they needed food. After further discussions with the local communities on the feasibility of implementing grain banks, we decided that rather than maintaining a grain bank, it would be better to establish a credit line for rice in the form of a Food Assurance Program (FAP). The major difficulty with the grain bank approach was thought to be the cost involved in storage and the need to guard against moisture and pests. A flowing credit would not have to face his problem. Surveys are being conducted to establish the baseline of needy families and those wanting to avail of such credit. A note on the FAP is attached.

A total of nineteen villages have been surveyed so far to assess the need for an FAP. 480 families with a total of 2830 family members have been identified that wish to participate in the rice credit scheme. The requirement of rice per day has been calculated to be 726 kg, working out to 21.78 tons for this group.

Of the population living below the poverty line, 65% are *Adivasis* and 35% are scheduled castes and others. The most food insecure period is from August to November when the old stocks of rice have been depleted and the new crop is not yet mature for harvesting.

The results of the survey on assessing needy families for the FAP are given below.

Village	**No. of Families**	**Total Family Members**	**Rice Requirement/Day (@250 gm/member)**
1. Agru	46	238	60 kg
2. Barka Toli	08	055	14 kg
3. Bhonda	35	265	65 kg
4. Bijulia	58	411	105 kg
5. Buchchi Dari	22	128	32 kg
6. Chapa Toli	51	114	30 kg
7. Ekka Gori	11	108	27 kg
8. Garia Toli	17	073	18 kg
9. Garri	28	216	55 kg
10. Guru	09	042	11 kg
11. Hehal	15	088	22 kg
12. Hetha	06	037	10 kg
13. Jamun Toli	21	118	30 kg
14. Kota	21	137	40 kg
15. Lal Bhonda	45	248	65 kg
16. Mahua Toli	17	79	20 kg
17. Mariatu	24	175	45 kg
18. Naya Sarai	33	204	52 kg
19. Tangra Toli	13	94	25 kg

Establishing Herbal Gardens

Three herbal gardens of medicinal plants have been established in Bhonda and Kachchabari villages in Ranchi and village Rupow in Nawada. Locally important medicinal plants as well as some obtained from the forest department nursery have been planted. All three herbal gardens have been established with the support of the adivasi community. They have provided the lands for the garden. The youth, women and children have shown their interest in the establishment of the gardens. They helped to collect local medicinal plants identified by the local *vaidyas* and *hakims* and planted in the gardens. Some medicinal plants were collected from the nursery of the Forest Department of Petalwar (Bokaro). Adivasi youth maintain the herbal gardens and help in the protection of the gardens.

There is interest in the herbal garden on the part of local healers. We plan to expand the garden and add more species to it. It is also proposed to conduct visits of school and village children to revive interest in local healing practices and underline the importance of conserving medicinal flora. It is proposed to ask the government for land on lease to expand the scale of the herbal gardens since taking too much land from farmers would impact negatively on their agriculture.

The herbal gardens are a good way to generate awareness and educate people especially youth who generally neglect the indigenous healing systems and the importance of medicinal plants. The herbal gardens are also proving to be helpful in reviving interest in traditional healing and conservation of locally available medicinal plants. Project staff are able to motivate women and men to conserve locally available important flora and about the growing market for herbal products.

List of medicinal plants in herbal gardens

S.No.	Vernacular Name	Botanical Name
1.	Aam	*Mangifera indica*
2.	Aaonla	*Emblica officinalis*
3.	Adrak	*Zingiber officinale*
4.	Akwand	*Calotropis procera*
5.	Ashwagandha	*Withania somnifera*
6.	Babui Tulsi	*Ocimum basilicum*
7.	Bach	*Acorus calamus*
8.	Baghandi/Reri	
9.	Bakain	*Melia azaedirach*

10.	Bakas	*Adhatoda vasica*
11.	Ban piyaz	*Urginea indica*
12.	Beng Sag	*Centella asiatica*
13.	Bhuin Aaonla	*Phyllantus niruri*
14.	Chandra Mool	*Kaempteria galanga*
15.	Chhota Dhaniya	
16.	Chiraita	*Swertia chirayta*
17.	Chirchiri	*Achyranthes aspera*
18.	Chittur	
19.	Chitrak	*Plumbago zeylanica*
20.	Dhatura	*Datura innoxia*
21.	Farhad	
22.	Gachh Kand	
23.	Genda Phool	*Tagetes erecta*
24.	Haldi	*Curcuma domestica*
25.	Kachnar	*Bauhinia variegata*
26.	Kalmegh	*Andrographis paniculata*
27.	Kapoor Kachri	*Hedychium spicatum*
28.	Karanj	*Pongamia pinnata*
29.	Kasaunji	*Cassia sophera*
30.	Katsaraiya	*Solanum indicum*
31.	Kutma	
32.	Lankeshwari	*Mirabilis jalapa*
33.	Motha Ghass	*Cyperus rotundus*

34.	Naga Dhania	
35.	Nimbu	*Citrus aurentifolia*
36.	Paththar Chatta	*Coleus aromatica*
37.	Phutkal	*Ficus innectoria*
38.	Pudina	*Mintha spicata*
39.	Putus	*Lantana camara*
40.	Ramtulsi	*Ocimum grandiflorum*
41.	Rangaini Bhata	*Solanum xanthocarpum*
42.	Sada Bahar	*Catheranthus roseus*
43.	Seedh	*Euphorbia antiquorum*
44.	Simal Kand	
45.	Sanp Papar	
46.	Safed Dubla	
47.	Tulsi Ghass	
48.	Urhul	*Hibiscus rosa sinensis*
49.	Lajwanti	*Mimosa pudica*
50.	Lal Tulsi	*Ocimum sanctum*
51.	Nirbisra	
52.	Papaya	*Carica papaya*
53.	Sindwar	

Exploring Opportunities for Income Generation

An assessment was made by a travelling survey of the forest produce available, the commercial linkages and the possibilities for income generation.

Information was gathered on the following:

1. What forest produce is available in the Ranchi area.
2. Forest produce collected by the Forest Department and by the *Adivasi* or local people of the area.
3. Where do they sell forest produce (*Hat/Arti*/Other Places)
4. What is the market rate of forest produce?
5. Who are the traders/buyers of forest produce/medicinal plants from this region?
6. Which organisations are working on medicinal plants?

DOCUMENTATION OF THE INDIGENOUS KNOWLEDGE RELATED TO AGRICULTURE AND TRADITIONAL HEALING

Methodology

Rural and Adivasi boys and girls who had finished school were selected for training to conduct the survey. Five teams of two each (a boy and a girl) were trained as surveyors in an orientation program. They were to go to villages and do the questioning as teams of two. During training they were told at length about the purpose of the documentation and the persuasive and patient methods that would be needed to extract information. The survey would be conducted using a standardized and tested questionnaire. The surveyors were also asked to assure the people they questioned that the knowledge obtained from them would remain their property and commercial interests would not misuse it. No use would be allowed without obtaining permission from them. They were also informed that the entire data would be stored with the Department of Science and Technology, Government of India but this would not confer ownership on the Department or the government, the ownership would rest with them.

Along with the training, awareness generation programs were held in various villages of the region about the new national and international developments in the field of biodiversity, about biopiracy and how this violated the rights of communities. Information was also imparted about the rights of local communities to share in the benefits derived from the commercial use of biological resources using indigenous knowledge. Questioning in villages was done in groups as well as in individual homes. Wherever possible, the adivasi vaidyas and traditional healers were questioned at length. Barring a few exceptions, most people cooperated in the survey and documentation.

Subsequent to training lectures and discussions, a survey form in Hindi was prepared after consultations with experts and forest department officials. The first version of the survey form was field tested by the principal investigator and the adivasi teams. Once the field test was done, the duplications and shortcomings of the questionnaires became apparent. It was realized that a long and detailed survey form was not suitable, as people did not have the patience to answer all the peripheral questions. It was decided to radically simplify the form and focus only on the actual knowledge and its use. The final version of the forms were printed and distributed to the teams for conducting the survey.

The survey was conducted in the following villages:

Ranchi

Bijulia-Mariatu, Jamuntoli, Bhonda-Garri, Kota-Hetha, Guru, Buchidari-Gariatoli, Hisri-Bajpur, Hururi, Malmaru, Patratoli, Kanjia, Burhakhokra, Karkara, Phungi, Katchachu, Gargaon, Palma, Chachgura, Kulli, Bhandra, Lodhma, Chandapar, Murhu, Kachchabari, Bindgaon, Kamta, Bajarmara, Barbe, Rigatoli, Kulhi.

Hazaribagh

Mahuri, Jarza, Simradhap, Gangara, Turi, Dihi, Belmakka, Devkuli, Puranpania, Garidih, Darigadhar, Phoophandi, Parasi, Khutra, Gardua, Boragara, Nachly, Hatkona, Gurudih, Perwatari, Kajwatar, Patiatari, Barkakaran, Khelari, Hardiatanr, Naina, Dohar, Gundhatari, Diwalbodh, Bajhapar Nadi,

Nawada

Rupow, Bhikampur, Benipur, Ajay Nagar, Dhanawan, Telari, Kasmara, Chhanaun, Sadikpur, Mahuli, Mahulia Tanr, Jharnama, Ranigadar, Nahudar, Daniyan, Mananpur, Lalpur, Madhurapur, Rupabel, Guthiya, Budhauli, Koiria Bigha, Kawla, Aitari, Asma, Diaura, Vishanpur, Bhalua, Hasna.

Nalanda

Kerua, Lakhachak, Bishunpur, Ranisarai, Durgapur, Mahila, Adampur, Satwa, Kandupur, Raitar, Mohanpur, Kapatia, Karahdih, Niyamat Nagar, Raghubigha, Junaidi, Majhanpur, Baraitha, Chorsua.

Developing database of Indigenous Knowledge (IK)

We have begun to develop the outlines of what a database on IK should look like. This work will continue. It needs to be understood however that we can propose a format for the database but the work will have to be done by the government, for legal reasons and for the reasons of establishing confidentiality and terms of access, as well as framing penalties for violations.

Indigenous Farming Methods

S.No.	Agricultural Operations	Indigenous Practices
1.	**Land preparation, fertilizer and nutrient management.**	a) Primary tillage in the form of 3-4 ploughing is done from January to May at long intervals. b) For direct seeded rice, cowdung is powdered and mixed properly with the soil after broadcasting of rice seeds and then planking is done. c) Pre sowing manuring for transplanted rice is done by keeping dried cowdung mixed with ashes in the field of different places in basketful of heaps .At the time of final ploughing the heaps are properly spread in the field. d) Deep summer ploughing, stirring, planking and levelling is done after every rain. e) Farmers practice crop rotation like Rice-Pea, Rice-potato, Maize-Pea, and Urd-wheat etc. f) Dung cake is burnt in the nursery plots of fingermillet (*Eleusine coracana)* prior to the first tillage operation for seed-bed preparation. g) Nearly all villagers produce manures i.e., wastage from house kept in a pit near home. A few farmers use dung cake and flowers as manure. Chemical fertilizer mainly DAP/Urea is applied only by some surplus and self-sufficient house holds. h) Scales of fishes and eggshells are applied to vege- tables and fruit plants in kiitchen gardens in up land and relatively medium lands.
2.	**Soil and seed treatment**	i) Before sowing, seeds are cleaned and exposed to the sun for some time. ii) Seeds like teak, which have hard, and thick seed coat are coated with wet soil or cowdung for sometime and there after termites are allowed to eat the seed coat. When seed coat becomes thin they are seeded.
3.	**Sowing and transplantation practices**	i) Seedlings of cauliflower, cabbage, tomato, brinjal, chilly, etc., are covered with leaves or straw or parer *thonga* (small bags) till their establishment.

		ii) Small and slippery seeds, such as mustard, *lal saag* etc., mixed with sand before sowing for upland and medium land. iii) Rice seedlings are uprooted after one months of sowing or when plant attains five-leaf stage for transplanting from nursery bed. Two days prior to uprooting of rice seedlings, nursery is heavily irrigated. iv) Three to five rice seedlings are taken together and transplanted in the same place.
4.	**Disease and Pest Management**	
	a) From birds and rodents	i) A bamboo stick is made into an arch like structure with a loop fixed in the middle of the arch, to trap birds .A no. of such arches are joined together to form a chain. ii) A sticker prepared from the latex of babool/hambrom tree is spread near the holes of the rodents or on the places where birds sit. When birds and rodents step on the latex, they get adhered. iii) Scraecrow is placed in the fields, nursery beds and vegetable gardens.
	b) From insects and pests	i) Ashes are dusted on the vegetable plants along with kerosene oil, when insect pest appears on the plant in the kitchen garden. ii) Caseworm, infested rice crop is beaten with a branch of *sindwar* leaves (*Vitax regungo)* in such a manner that case worm falls in the ground water. Then water is drained out. iii) Field infested with termites and disease is ploughed with *desi* plough made of *neem* wood. iv) *Neem* and *Karanj* cakes are applied 15 to 20 days prior to sowing in termite infested fields. v) Tender bamboo is cut into small pieces and kept in a small pot with water. After 2 to 3 days it is applied to the insect- pest infested rice fields. vi) The straw of ragi is kept near the source of irrigation water, which flows into the fields.

5.	**Water Management**	i) Rainwater is collected from the catchment of protected hilltops in a pond with seepage control. Silt retention tanks are constructed at several points before the run-off water enters into the pond. The cultivation fully depends on the amount of water stored in the pond. ii) The tribal people conserve soil and water by using tree trunks laid across the field in parallel lines at short distance to serve as barrier to run-off water. These dams break the velocity of the runing water and thereby check oil erosion. Moreover, much of the water that is held back seeps into the soil and recharges groundwater and also prevents the accumulation of large amount of water at the base, which could otherwise result in a multitude of problems. iii) A series of earthen bunds are constructed across the farmland, according to the slope of the land. iv) Small and big earthen ponds are common to conserve rainwater. The water is generally used for rabi crops. v) Small canals are also linked with the seasonal rivers to irrigate the crops. vi) *Kuchcha* wells are the popular and easiest way to harvest rainwater and recharge the soil. Most of the farmers used the well to irrigate vegetables and other rabi crops like wheat.
6.	Harvesting & Post Harvesting Practices	i) Harvesting of paddy is done during pre-full maturation stage. ii) Harvested paddy produce is left in the field for two to three days, after harvesting of per-full matured crops. iii) Harvested produce is spread in a circle in the threshing ground and bullocks are made to walk on it in a circular path. iv) Foot operated device locally known as *Dhenki* or *Dinkhi* is used for hulling of grains.

7.	**Seed & Grain Storage**	Before keeping the seed/grains into the *Mari/Morrah/Dimni* an indigenous storage structure, seed/grains are sundried, so that moisture content in seed/grain remains favourable for storage. Dried grains are checked by bitting in two parts with sound. It makes sure that the seed/grain is ready to store.
8.	**Seed Selection**	
	Selection in the Field	Farmers observe the best one plant or panicle, which looks helthy, is harvested separatly and kept for the next season.
	Selection at Home	Women select the healthy and solid seeds; it is dried in the sun and then kept into *mori* for the next season.

IK-Human Health (Plant Based)

S.No.	Medicinal Plants	Traditional Use	Source
1.	*Beng Saag* (*Centella asiatica*)	Having high medicinal value in Jaundice. It is also cooked as vegetable and leaves can be stored in dried form.	Mahadev Oroan, Charku Baitha, Shafeeq Ansari and Ranu Oroan. Vill. -Bijulia, Ratu.
2.	*Muchari Saag (Lymnophylla Conferta*	Used for cleaning mouth during fever as well as to increase appetite.	Ram Lakhan Baitha, Anant Mahto, Punnai Oroan. Vill. -Bijulia, Ratu.
3.	*Chiraita (Swertia chirayata)*	Both leaves and branches are soaked in water overnight and consumed to increase apetite.	Zameerudin Ansari, Sukra Oroan, Bhakru Oroan and Rahman Ansari. Vill.-Bhonda, Ratu.
4.	*Kapoor Tulsi (Ocimum bacilicum)*	The leaf juice and seeds are used in cough and bronchitis.	Israfil Ansari, Khadim Rasul, Mohamad Khan and Nazer Ansari Vill. -Gadri, Ratu.
5.	*Bach/* Sweet Flag *(Acorus calamus)*	Rhizome is mixed with mustard oil and make in paste form. The Paste is applied over the chest in the treatment of pneumonia.	Zamiruddin Ansari, Khalil Ansari, Biswa Oroan. Vill. –Bhonda, Ratu.
6.	*Chandra mool ((Kaempteria galanga)*	Tribals use the rhizome with decoction of pepper seeds for the treatment of cancer.	Budhu Oroan and Mangra Oroan. Vill. -Kotta, Ratu.
8.	*Kapoor Kachri*	The juice extract of leaves are used in fever.	Jharia Devi, Jeetu Oroan, Rama Oroan and Sattar Ansari Vill. –Kotta, Ratu.
9.	*Kalmegh (Andrographis paniculata)*	Kalmegh leaves are boiled in water .The boiled water is used to wash all types of wounds. Used against worms, Loose motion and Malaria.	Bhakru Oraon, Sukra Oraon, Budhan Lakra and Budhnath Lakra Vill. –Bhonda, Ratu.

10.	*Kundru* leaves *(Coccinia indica)*	The leaf juice extract is applied to the ear in pain	Biswa Oraon and Bandhan Lakra Vill. –Bhonda, Ratu.
11.	*Sidh* leaves	The milk extract of the leaves is soaked in cotton. This cotton is kept in the mouth at the place of tooth pain.	Han Oraon, Biswa Oraon and Habibul Ansari Vill. –Bhonda, Ratu.
12.	*Doob* grass along with *Dhori* oil, Arwa rice, *Desi* egg and raw haldi	A paste of the mentioned ingredients is used as an effective medicine in treatment of migrane.	Sukra Oraon, Bhakru Oraon. Vill: Bhonda, Ratu.
13.	*Pipermint Grass*	The flowers of this plant are eaten in toothache.	Rahman Ansari and Jahangir Ansari Vill. –Bhonda, Ratu.
14.	Tamrind *(Tamarindus indica)*	The dried and powdered leaves and old fruits of tamrind are useful in dysentry.	Bande Oraon, Yamuna Oraon, Vijay Oraon, Jitia Oraon. Vill. –Jamuntoli, Ratu.
15.	Wild *Brinjal* seeds and wild O*nion* seeds	The seeds of wild *brinjal or onion* are heated over charcoal. The fumes that come out are inhaled through the mouth. This fume kills the worms of the decayed teeth.	Moga Oraon,Mange Oraon, Fagu Oraon, Durga Oraon. Vill. –Jamuntoli, Ratu.
16.	*Makhchand* tree	The dried flowers are soaked in water overnight. The water is then strained and mishri is mixed into it. The juice is used as medicine in stomach pain.	Bandhan Oraon, Jitia Oraon, Vijay Oraon, Mange Oraon, Ramesh Oraon and Durga Oraon Vill. –Jamuntoli, Ratu.
17.	*Ole (Amorphyllus spp.)*	Three drops of juice of ole tuber is applied in acute ear pain. Before applying the ole juice, mustard oil is applied in the area around the ear to prevent itching caused due to ole	Bande Oraon, Durga Oraon, Jitia Oraon, Bandhan Oraon, Ram and Mange Oraon Vill.-Jamuntoli
18.	*Chakod (Cassia tora)*	*Chakod* is used as vegetable as well as medicine for treatment of diabetes.	Haura Oraon, Mangra Oraon, Charia Devi, Birsa Tirkey, Suka Oraon and Daya Oraon Vill. -Garia Toli, Ratu.

19.	*Munga/Sahajan (Moringa olerifera)*	*Munga/Sahajan* has high qualitative medicinal properties. Every part of the plant i.e. root, shoot, flowers, fruit and leaves are used. It controls blood circulation of the body. Paste of the root is used as a medicine against snakebite.	Israphill Ansari, Sahdul Ansari, Akhtar Ansari, Punnai Oraon, Ranu Oraon and Kashinath Baitha. Vill. -Gadri
20.	*Amaltas (Bauhinia verigata)*	Root, bark and leaves are used for preparing important medicines. The are used in skin disease, boils, swelling of joints, and biting of Poisonous insects.	Sukra Oraon, Biswa Oraon, Budhan Lakra, Rahman Ansari, Khurshid Liahrs and Budhan Lakra. Vill: Gadri, Ratu.
21.	*Karanj (Pongamia pinnata)*	The seeds of *karanj* are used in treatment of chronic skin diseases, swelling of joints and blood dysentry. Karanj oil is as hair dye, it also checks from hair loss. Tribal people use the oil as a mosquito repellant.	Sattar Ansari, Jutu Oraon, Sukra Oraon, Budhu Oraon, Umar Ansari and Rasul Ansari. Vill. –Kotta, Ratu.
22.	*Chirchira (Trichosmthes anguinal)*	The effective uses of *chirchira* are:- •To stop excessive bleeding from wounds •Effective in tooth pain •Ear pain, ringing in ears	Oraon, Birsa Tirkey, Chango Oraon, Charia Devi and Suka Oraon. Vill. - Garia Toli, Ratu.
23.	*Chiraita (Swertia chirayata)*	*Chiraita* is a very useful medicinal plant. This is effective in fever, cough, cold and jaundice.	Madan Mahto, Kedar Mahto, Mahesh Mahto, Ram Lal, Ram Lakhan Mahto and Rohit Mahto. Vill. –Guru, Ratu.
24.	*Peepal (Piper longum)*	The fruits of peepal is effectivey used in cronic cough	Hundru Oraon, Birsa Tirkey, Kattawa Oraon, Charia Devi and Makai Oraon Vill. -Garia Toli

25.	*Bel* *(Aegle marmelos)*	The juice of raw fruits of *bel* is used to prevent sunstroke. The roasted fruit is also useful in dysentry.	Ram Lakhan Mahto and Dildar Hussain. Vill: Bhonda-Guru, Ratu.
26.	*Arhar* *(Cajanas cajan)*	Extract of tender leaves of arhar are applied 1-2 times daily for one week to get relief from ear pain.	Madan Mahto, Kedar Mahto, Ram Lal, Lakhan Mahto and Prakash Mahto.
27.	*Ginger* *(Zingiber officinalis)*	The ginger juice is used to cure cough and cold.	Dildar Hussain. Bhonda, Ratu.
28.	*Bhelwa*	The bhelwa seed is touched to the newly born baby to keep them away from the allergies. This trend is very common among the tribal people.	Mange Oraion, Ganesh Oraon, Jitia Oraon, Somra Oraon and Kisun Oraon Vill.-Jamuntoli
29.	*Bamboo* *(Bamboosa arundinaceae)*	The twig of the bamboo branches is used as toothbrush to cure pyorrhoea.	Bandhan Oraon, Mage Oraon, FaguOraon, Moga Oraon and Ramesh Oraon. Vill.- Jamuntoli
30.	*Bhusri*	The juice of the leaves is used as an antiseptic.	Chirag Ansari, Jamiruddin Ansari, Khalil Ansari, Bhakru Oraon, Sukra Oraon, Budhan Vill. –Bhonda
31.	*Chittur*	The leaves of the plant are pasted on the infected skin to cure eczema.	Oraon, Bhakru Oraon, Bud Jamiruddin Ansari, Khalil Ansari, Rahman Ansari and Jahangir Ansari Vill.-Bhonda
32.	*Kutma*	The fruit of the shrub is used to improve apetite and cure enlarges gall blader.	Israphill Ansari, Sahdul Ansari, Akhtar Ansari, Punnai Oraon, Ranu Oraon and Kashinath Baitha. Vill. -Gadri

33.	*Khapra*	The juice of the leaves is effective to cure wound and skin cut.	
34.	*Mahua (Madhuca indica)*	The twig of the tree is used to cure pyorrhoea. Its dried powdered bark is also used for pyorrhoea. The powder is dissolved into hot water and gargled.	
35.	*Haldi (Curcuma longa)*	Haldi powder is mixed into milk and used by the patient to cure chronic cough.	
36.	*Garlic (Allium sativum)*	Garlic is chewed in case of cough and cold.	
37.	*Kanchapra*	It is a kind of mushroom grown on Karanj tree. It is boiled in the karanj oil and its paste is applied on the ear wound.	
38.	*Karanj Oil (Pongamia pinnata)*	There is a black spider in the rural area of Ranchi which is boiled in the karanj oil and applied on the wound, the wound is mostly occur at the chin.	

IK-Human Health (Disease Based)

ASTHMA

Method: 1

Plant Used: Bahera (*Terminalia bellirica*)

Part Used: Bark

Method of Use: A peace of bark of *Bahera* is kept into mouth and chewed and sucked. This brings about a control in breathing trouble and cough also comes out easily.

Method: 2

Plant Used: Bakas (*Adhatoda vasica*)

Plant Part Used: Leaves

Method of Use: Leaves are burnt and the fumes are inhaled to control the breathing trouble.

Method: 3

Plant Used: Motha (*Cyprus rotundus*)

Plant Part Used: Root

Method of Use: Root is chewed in an empty stomach.

Method: 4

Plant Used: Amla (*Emblica officinalis)*

Plant Part Used: Fruit

Method of Use: Juice of *amla* fruit is extracted. Used one teaspoon twice a day.

Method: 5

Plant Used: Amla (*Emblica officinalis*), Mulhatti (*Glycyrrhiza glabra*)

Part Used: Fruit of *amla*, roots of *muhatti*

Method of Use: Dried *amla* fruit is made into powder, similarly a dried root of *mulhatti* is powdered. Both are mixed in equal quantity. One spoon of the mixture is used in empty stomach twice a day.

Source: Uday Mahto, Vill: Bijulia, Ratu, Ranchi.

HIGH BLOOD PRESSURE

Plant Used: Watermelon (*Citrullus vulgaris*)

Plant Part Used: Fruit pulp

Method of Use: Daily 250 gm use of the fruit of watermelon is effective in the treatment of High Blood Pressure.

LOW BLOOD PRESSURE

Plant Used: Carrot (*Daucus carrota*)

Plant Part Used: Juice

Ingredient: Honey

Method of Use: Juice of carrot is extracted and mixed with honey. One spoonful is consumed twice a day.

BLOOD PURIFIER

Plant Used: Chiraita (*Swertia chiraita*)

Plant Part Used: Whole plant of *Chiraita*.

Method of Use: The whole plant along with the root is grinned into a paste, this is than mixed with water and kept aside for few hours. This is then drink in empty stomach.

Source: Nesar Ahmed, Village: Baridih, P.O. Sinjo
P.S : Kuru, District: Lohardaga, Jharkhand

BODY PAIN

Plant Used: *Ghora Kanta*

Plant Part Used: Leaves and Branches

Ingredients: Mustard oil

Method of Use: Mustard oil is heated and leaves and branches of the plant are cooked in this oil. This oil is left for sometime and then the body is massaged with the oil.

Source: Shri Rore Bhagat, Village - Bairgara, District - Ranchi.

BURNING SENSATION

Method: 1

Plant Used: *Pansagwa Sag*

Plant Part Used: Whole plant

Method of Use: Grind the plant with water and apply the paste over the burnt part of the body.

Method: 2

Plant Used: Dhawa (*Anogeissus latifolia*)

Plant Part Used: Flower

Ingredient: Sugar

Method of Use: The flower of the plant is grinded with a small quantity of sugar. The preparation is consumed two to three times.

Method: 3

Plant Used: Black piper (*Piper longum*)

Plant Part Used: Bark

Ingredient: coconut oil

Method of Use: The bark of the plant is fried and grinded with a small quantity of coconut oil. The preparation is used two to three times. It is very effective to control the burning.

CHICKEN POX

Plant Used: Neem (*Azaderichta indica*)

Part Used: Leaf

Method of Use: It is boiled in water and water is use for drinking and some leaves are hanging on the door.

CHRONIC COUGH

Method: 1

Plant Used: Amla (*Emblica ifficinalis*)

Plant Part Used: Fruit

Ingredient: Misri (saturated form of sugar)

Method of Use: Dried fruit of *amla* is powered and mixed with *misri*. One spoon powder is used two to three times in a day with cold water.

Method: 2

Plant Used: Bhera (*Terminalia bellirica*) and Pippli (*Piper longum*)

Plant Part Used: Fruits

Ingredient: Honey

Method of Use: Dried fruit of *Bhera and piple* is powered and mixed with honey. The paste is used two to three times in a day.

Mehod: 3

Plant Used: Bhera (*Terminalia bellirica*)

Plant Part Used: Bark

Ingredient: Honey, Nausader, Geru, Gold bhasm,

Method of Used: Dried bark of *Bahera* is powdered and mixed with ingredients. The powder is used two to three times in a day.

Mehod : 4

Plant Used: Nagar montha (*Cyperus scariosus*)

Plant Part Used: Root

Method of Use: Dried root of *nagarmontha* is powered and mixed with ingredients. The powder is used two to three times in a day.

Method: 5

Plant Used: Gular (*Sterculia urens*)

Plant Part Used: Fruit

Ingredient: Spices

Method of Use: Make pickle or vegetable or *chutni.* Used two to three times in a day.

Method: 6

Plant Used: Ghrit kumari (*Aloe barbadensis*) and Kukraunda (*Pluchea indica*)

Part Used: Root

Method: Dried root of *Ghrit kumari* and *Kukraunda* is boiled and used two to three times in a day.

COUGH AND COLD

Method: 1

Plant Used: Bahera (*Terminalia bellerica*), Harra (*Terminalia chebula*), Ginger (*Zingiber- officinale*), Aonla (*Emblica officinalis*)

Plant Part Used: Fruits of Bahera, Harra and Aonla are powdered and mixed with the crushed ginger rhizome and *misri*.

Method of Use: One spoon twice a day with mild hot water.

Source: Shri Balu Oraon, Vill: Garke Kera Toli
Post: Kane, Block: Karra
Distt: Ranchi, Jharkhand.

Method: 2

Plant Used: Ginger *(Zingiber officinale)*

Plant Part Used: Rhizome

Ingredient: Honey

Method of Use: Boil a glass of water with a small piece of ginger; mix one spoonful honey into the hot water. The preparation is used three times in a day.

Source: Shri Tufail Khan, Bariatu Basti, Bariatu, Ranchi.

Method: 3

Plant Used: Tulsi (*Ocimum sanctum*)

Plant Part Used: Leaves

Method of Use: The leaves of the *tulsi* is boiled in one glass of water and consumed four to five times in a day.

DIABETES

Method: 1

Plant Used: Pani Phal *(Trapa natans)*

Plant Part Used: Fruit

Ingredients: Revan Sugar, Kalpi Misri (Concentrated sugar)

Method of Use: Revan Sugar – 25 gm, Kalpi Misri – 25 gm, Dried Pani Phal – 25 gm. Grind all the above ingredients and then make them into paste by mixing in milk or water. The small amount is consumed in the morning and evening.

Method: 2

Plant Used: Blackberry (*Syzygium cumini*)

Plant Part Used: Seed

Ingredient: Black Salt

Method of Use: 250 gm of Blackberry seed and 10 gm black salt are grinded together and made into powder. One teaspoon of the powder is consumed along with the starchy water of rice in empty stomach for one month.

Precaution: All sour fruits and food items should not be eaten during this period.

Method: 3

Plant Used: Gurhal (*Hibiscus rosa sinensis*)

Plant Part Used: Flower

Method: Fresh flowers are consumed every morning and evening.

Method: 4

Plant Used: Ashok, Amla, Jamun, Bel,

Plant Part Used: Bark of Ashok, Juice of Amla, Jamun and Bel,

Ingredients: Water

Method of Use: All ingredients crushed and mixed into water and consumed 2-teaspoonful daily.

DIARRHOEA

Plant Used: Lemon (*Citrous lemon*), Beng Sag (*Bacopa monnieri*)

Plant Part Used: Lemon fruit, whole plant of Beng sag

Ingredient: Salt

Method of Use: Lemon juice and a pinch of salt are mixed with the *beng sag* and made into paste. The paste is mixed in a cup of water and given to the patient six to eight times in a day.

Source: Shri Khukhiya Toppo, Vill: Garke Kera Toli
P.O. Kane, P.S. Karra, Distt. Ranchi.

DURABILITY

Plant Used: Antmool

Plant Part Used: Root

Method of Use: The root of the plant is grinned with water and consumed.

DYSENTERY

Plant Used: Dudhiya Ghans (*Cynodon Dactilon*)

Plant Part Used: Whole grass

Ingredient: Black piper

Method of Use: Grind the fresh part of the grass with black piper, add a pinch of salt and consume three to four times in a day.

EAR PAIN

Method: 1

Plant Used: Mango (*Mangifera indica*)

Plant Part Used: Leaves

Method of Use: Juice of fresh mango leaf is extracted. This juice is heated slightly and then 2 –3 drops of the juice is applied into the ailing ear.

Method: 2

Plant Used: Garlic (*Alium sativum*), Sindwar (*Vitex negundo*), Dhatura (*Datura innoxia*), Gourd (*Cucurbita sp*.)

Plant Part Used: Leaves of all the plant

Method of Use: Juice of all the leaves are extracted and mixed together. This juice is heated slightly. 2 – 3 drops are applied to the ear.

Source: Rampodi Koiri. Vill: Nayak Jobla, Silli, Ranchi.

Method: 3

Plant Used: Tendu and Arhar (*Cajanus Cajan*)

Plant Part Used: Leaf juice extract

Method of Use: Used 1 – 2 times *Tendu* and *Arhar* leaves juice extract for one week.

Method: 4

Plant Used: Onion (*Allium cepa*)

Plant Part Used: Bulb

Method of Use: Used 2 drops of onion bulb juice into ears.

Method: 5

Plant Used: Garlic, Sindwar, Kundri, Chaghra,

Plant Part Used: Bulb of garlic and others leaf

Method of Use: Crushed all the integrands and hit for few minutes and used 2 drop one time.

ECZEMA

Method: 1

Plant Used: Amar Lata

Plant Part Used: Whole tendrils

Method of Use: Dried tendrils are burnt and the ash is mixed with the mustard oil. The lotion is applied on the affected part of the body. It helps to control the itching and discharge.

Method: 2

Plant Used: Neem (*Azaderahcta indica*)

Plant Part Used: New leaves, Seeds, Bark

Method of Use: Eat new leaves at morning after brushing, it serves as a blood purifier. Seeds and bark should be used as a paste mixes with s*irka* (vinegar). The lotion is applied on the affected part of the body. It helps to control the itching and discharge.

FEVER

Method: 1

Plant Used: Edula

Plant Part Used: Leaf

Method of Use: The fresh leaves of the plant are boiled in one glass of water until it becomes one fourth. The preparation is used in general or seasonal fever.

Method: 2

Plant Used: Ghod bans (Wild bamboo)

Plant Part Used: Whole plant

Method of Use: *Ghod Bas* is grinned and mixed with water and consumed by the patient

Source: Krishna Lohra, Vill. : Pahan Toli, P.O. : Tati Silve, Ranchi

Method: 3

Plant Used: *Chirta, Chiraiya*

Plant Part Used: Whole plant

Method of Use: *Chirta, Chiraiya* is grinded and mixed with water and consumed by the patient.

Method: 4

Plant Used: Dhanotar (*Datura innoxia*)

Plant Part Used: Whole plant

Method of Use: Dhanotar is grinded and mixed with water and prepared sirka and consumed by the patient

Method: 5

Plant Used: Nagarmotha (*Cyperus scariosus*)

Plant Part Used: Fruit

Method of Use: Nagarmotha is grinded, mixed with water and consumed by the patient

Method: 6

Plant Used: Kalmegh (*Andrographis paniculata*)

Plant Part Used: Whole plant

Method of Use: Kalmegh is grinded mixed with water and prepare sirka and consumed by the patient

GASTRIC

Method: 1

Plant Used: Harra (*Terminalia chebula*), Bahera (*Terminalia bellirica*), Aonla (*Emblica officinalis*)

Plant Part Used: Fruits of Bahera and Aonla, Leaves of Harra

Method of Use: The fruits and leaves are dried in shade. The dried items are powdered and mixed together. One spoon powder with cold water is used daily in morning time.

Source: Shri Gobardhan Oroan, Vill/P.O. Bharno, P.S. Sisai
District: Gumla, Jharkhand.

Method: 2

Plant Used: Dumar (*Ficus glomerata*)

Plant Part Used: Ripen Dumar fruit

Ingredient: Black Salt

Method of Use: A pinch of black salt is mixed with the powder of the sun dried ripen fruit. One teaspoon at every morning with cold water.

Source: Hakim Abdul Latif Khan, Bariatu Basti, Ranchi.

Method: 3

Plant Used: Sanna

Plant Part Used: Leaves

Method of Use: Sanna leaves are dried and powdered. Powder is mixed with salt and water. One teaspoon of the powder is consumed in morning and evening for 15 days.

Source: Shri Suneshwar Sahu, Village - Middha
P.O. - Bhandra, District – Lohardaga.

HAIR PROBLEM

Method: 1

Plant Used: Bhringraj (*Eclipta alba*)

Plant Part Used: Plant juice

Method of Use: Crushed the collected plants and the juice should be used to massage hair and leave it for dry at least one hour then wash.

Method: 2

Plant Used: Grapes (*Vitis vinifera*)

Plant Part Used: Fruit juice

Method of Use: Crushed the grapes and juice should be used to massage hair and leave it for one hour then wash. It controls hair loss problem.

Method: 3

Plant Used: Amla, sikkakai, Ritha

Plant Part Used: Fruits

Method of Use: Crushed the collected plant fruits and dipped in water over a night and then used for washing the hair.

HEADACHE

Plant Used: Imali (*Tamarindus indica*)

Plant Part Used: Fruits

Method of Use: The dried fruits of the plant are dipped in one glass of water; then filtered and mix some amount of sugar and drink.

ITCHING

Plant used: Pitaungi plant

Plant Part Used: Seeds

Method of Use: Necklace is made out of the seed and worn around the neck or arm.

Source: Shri Uday Nath, Village - Tunku,
P.O. - Towadu**,** P.S. - Silli
District - Ranchi

JAUNDICE

Method: 1

Plant Used: Sijui

Plant Part Used: Stem

Ingredient: Sugar

Method of Use: The fresh and peeled off stem is grinded with sugar and given to the patient. One spoonful of the preparation is used every morning and evening for five days.

Method: 2

Plants Used:	Beng saag, Gaujbanfal, Mango, Blackkerry, Karanj, Neem
Plant Part Used:	Whole plant of beng saag, gaujbanphal fruit, bark of mango, bark of blackberry, Karanj-bark. Neem-bark
Method of Use:	25 gm of each of the above mentioned Ingredients are taken in one glass of water and heated, when the amount of water became half the mixture is taken and filtered by a clean thin cloth . 1/2 table spoon of this juice is consumed every day in the morning in empty stomach.
Source:	Hakim Abdul Latif Khan, Bariatu Basti, Ranchi.

Method: 3

Plant Used:	Beng sag
Plant Part Used:	leaf
Ingredient:	Misri (Concentrated sugar)
Method of Used:	Dried leaves are grinned with *misri.* The powder is taken three times in a day.

Method: 4

Plant used:	Mango, Black berr, Neem, Karanj, Sauna.
Part Used:	Bark
Method of use:	250 gms of each plant bark are boiled in 2 lit. of water and mixed with 25gms *saunf*. When the water becomes 1 lit then it is strained. The formulation is given to the patient 3 times in a day.
Source:	Md. Tufail Khan, Bariatu Basti, Ranchi.

Method: 5

Plants Used:	Bakla of sea, Gajra root, Banana,
Plant Part Used:	Sea Bakal –50 gms, Gajra- root –3, Banana – Row fruit 50 gms.
Ingredient:	Mishri – ¼ the gms.
Method of Use:	Mix all other above-mentioned ingredients and make into paste. Divide this paste into 3 parts, 1 part is consumed daily for 3 days in empty stomach.
Source:	Shri Ramcharan Prajapati, Village-Kamta. P.o.-Kucchu, Ranchi

Method: 6

Plant Used:	Jahajuhji
Plant Part Used:	Jahajuhi – Root – 1/2kg.,
Ingredient:	Mishri – 150gms, Water – 7glass.
Method of Use:	Jahajuhi root and Mishri are mixed together and grinded. Add 7 glass of water and left over night. This is then consumed (1/2glass) thrice in a day.
Precaution:	Pumpkin, Urd, Fish, Buffalo meat
Source:	Shi Ramcharan Prajapati, Village – Kamta P.O.- Kucchu, Ranchi.

Method: 7

Plant Used:	Rakedbani, Kewa, Kanda.
Plant Part Used:	Rakedbani and Kewa root, Kanda(rhizome)
Ingredient:	Cowdung.
Method of Used:	All the above ingredients are grinded and mixed with one cup of water and given to the patient.

Method: 8

Plant Used:	Makchund
Plant Part Used:	Flower
Ingredient:	Water
Method of Used:	All the above mentioned ingredients are grinded and mixed in water in the ratio of 1:3 and given to the patient.

Method: 9

Plant Used:	Bel *(Aegle marmelos)*
Plant Part Used:	Leaf
Ingredient:	Water, Misri (Concentrated sugar)
Method of Used:	All the above-mentioned ingredients are grinded and mixed in water and given to the patient.

Method: 10

Plant Used:	Ghritkumari (*Aloe barbadensis*)
Plant Part Used:	Pulp
Ingredient:	Water, Misri (Concentrated sugar)
Method of used:	All the above mentioned ingredients are grinded and mixed in water and given to the patient.

Method: 11

Plant Used:	Garpirodha
Plant Part Used:	Root
Ingredient:	Water, Black piper
Method of Used:	All the above-mentioned ingredients Are grinded and mixed in water and given to the patient.

Method: 12

Plant Used:	Seiz
Plant Part Used:	Bark
Ingredient:	Water, Misri (Concentrated sugar)

Method of Used: All the above-mentioned ingredients are grinded and mixed in water and given to the patient.

Method: 13

Plant used: Bariyar

Parts used: Root

Ingredient: Water

Method of Used: All the above-mentioned ingredients are grinded and mixed in water boiled and given to the patient.

Method: 14

Plant Used: Tulsi (*Ocimum bacilicum*)

Plant Parts Used: Any form

Ingredient: Water,

Method of Used: The leaves of above-mentioned ingredients are crushed and mixed in Water and given to the patient.

MALARIA

Method: 1

Plant Used: Dhanotar (*Datura innoxia*)

Plant Part Used: Root

Method of Use: The dried root of the plant is boiled in one glass of water; it is boiled until the one – fourth of the water is left. The filtered liquid is given to the patient two teaspoon every morning and evening.

Method: 2

Plant Used: Chirayta (*Swertia chiraita*)

Plant Part Used: Root

Method of Use: The root of the plant is boiled in one glass of water until it becomes one-fourth. The one spoonful of the preparation is given to the patient every morning and evening.

Method: 3

Plant Used: Nil kand

Plant Part Used: Tuber

Method of Use: The tuber of the plant is dusted and taken in an empty stomach.

NEUROLOGICAL PROBLEMS

Method: 1

Plant Used: Aethwan

Plant Part Used: Root

Ingredient: Sugar

Method of Use: The root of the plant is grinded with sugar and mixed in a cup of water. The patient consumes the preparation two times in a day.

Method: 2

Plant Used: Datura (*Datura mentel*)

Plant Part Used: Leaf

Ingredient: Mustard Oil

Method of Use: The leaf of the plant is heated with mustard oil in fire and banded over the affected part. The method is effective especially in the cold season, and especially for the old age person.

Method: 3

Plant Used: Tamba (*Leucas aspera*)

Plant Part Used: Root

Method of Use: The dried root of the plant is boiled in one glass of water until it becomes one fourth. The preparation is used in chronic neurological problems, shivering and numbness.

NOSE BLEEDING

Plant Used: Amla (*Emblica officinlis*)

Plant Part Used: Fruit

Ingredient: *Ghee*

Method of Use: Dried Amla is fried into ghee and the fired material is mixed with water and rubbed on the head. The method is effective to cure nose bleeding.

NUMBNESS IN HANDS AND LEGS

Method: 1

Plant Used: Garlic (Alium sativum), Ginger (Sonth- dried ginger) (*Zingiber officinale*)

Plant Part Used: Rhizhome

Method of Use: One piece of raw garlic is eaten with *sonth*, every morning.

Method: 2

Plant Used: *Parsaut*

Plant Part Used: Root

Method of Use: The root is boiled in one glass of water. It is boiled until the water becomes one-fourth. The patient every morning and evening uses this water.

PILES

Plant Used: Til (*Sesamum indicum*)

Plant Part Used: Seed

Ingredient: Curd

Method of Use: Black *til* is mixed in half cup of curd. It is consumed early in the morning.

PIMPLES

Plant Used: Dub grass (*Cynodan dectylon*)

Plant Part Used: Hole plant

Method of Use: Early morning collect dew from the grass and use it as a face wash.

RING GUARD

Plant Used: Tulsi (*Ocimum bacilicum*)

Plant Part Used: Leaves

Method of Use: Juice of *Tulsi* leaves is extracted and applied on the spot of ring wound. It is applied two to three times in a day.

SEXUAL DISEASE

SPERMETORHOEA

Plant Used: Small Ganjad (pipple) (*Piper longum*)

Plant Part Used: Buds

Method of Use: Sun dried pipel buds are grinded and mixed with honey in equal ratio. Used one glass of this solution in empty stomach for a week.

NIGHT FALL

Plant Used: Chalta tree (*Dillenia indica*)

Plant Part Used: Fruits

Method of Use: The fruits are grinded and mixed with water in ther atio of 1:2. Used one glass of this solution in empty stomach for five days.

LUKORHOEA

Plant Used: Musa kanda, Dhatu root, Nagar montha, Bark of mango, Kuber bark

Plant Part Used: Bark, root

Method of Use: All ingredients are mixed with water in the ratio of 1:2 and boiled upto half of it, and then drink one glass at morning and half of glass at night.

SNAKE & SCORPION BITE

Method: 1

Plant Used: Chirchiri (*Achyranthus aspera*)

Plant Part Used: Root

Method of Use: The root of the plant is grinded in water and applied to the poisoned part of the body.

Method: 2

Plant Used: Adajal

Part Used: Root

Method: The root of the plant is grinded in water and drink while snake is biting.

STOMACH PAIN

Method: 1

Plant Used: *Balam Kheera (Cucumis sativus)*

Plant Part Used: Whole Fruit

Method of Use: *Balam Kheera* is peeled off and cut into small pieces. These pieces are kept in an earthen pot and left aside for a night. In the morning this water is strained and drunk in empty stomach for four to five days. This clears the stomach and brings relief.

Source: Shri Chunda Darwani
Village : Bilti
Block : Bero
District : Ranchi

Method: 2

Plant Used: *Baitra Ardhi*

Plant Part Used: Root of plant

Method of Use: First of all the roots are dried. 10g Baitra Ardhi and 5g .
Bokla are grinded into powder. One spoon of this powder is enough to relief pain in stomach.

Source: Shri Suneshwar Sahu
Village: Middha
P.O.: Bhandra
District: Lohardaga

Method: 3

Plant Used: *Chiraita* (*Swertia chiraita*)

Part of plant Used: Whole plant

Method of Use: *Chiraita* plant is grinded and given to the patient along with water

Source: Shri Krishna Lohra
Village - Pahan Toli
P.O. - Tati Silve
P.S. - Tati Silve
Dist. - Ranchi

Method: 4

Plant Used: Sonth, Ajawain, Kali mirch, Jira, Pudina, Harad, Dhaniya,

Ingredients: Black salt, Sendha namak, Common salt, Water, Hing,

Method of Use: 20-20 g sonth, Black salt, and ajawain, and 10 g each of common salt, sendha namak, black piper, Jira, Pudina, Harad, Dhaniya and 5 g of Hing crushed and sieved with fine sieve and stored in a well dryed bottle and taken while stomach problem.

KIDNEY STONE

Method: 1

Plant Used: Kulthi (*Dolichos biflorus*)

Plant Part Used: Kulthi pulse

Method of Use: Thick kulthi pulse is mode along with salt and water. One eating this pulse the stone in stomach melts down and comes out along with the urine.

Method: 2

Plant Used: Black berry (*Syzygium cuminii*)

Plant Part Used: Black berry seed

Ingredient: Curd

Method of Use: The seed of Black berry is powdered, mixed with curd and eating by the patient.

Method: 3

Item used for treatment: Duck meat.

Method of Use: Duck meat is cooked and eaten hot once on a year to prevent stone formation in stomach.

TOOTH ACHE

Method: 1

Plant Used: Mahua (*Madhuca indica*)

Plant Part Used: Bark (chhal)

Method of Use: Boil the bark in plain water and water should be used. Morning and evening both times use this water for kulla purpose.

Method: 2

Plant Used: Sakhu/Teak (*Tictona grandis*)

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem.

Method: 3

Plant Used: Karanj *(Pongamia pinnata)*

Plant Part Used: Soft stem (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem. One more benefit of it solve the problem of sugar.

Method: 4

Plant Used: Neem (*Azadericta indica*)

Plant Part Used: Soft stems (Datuan)

Method of Use: Soft stem is used for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem. It also provides full day mouth fresh and control pimples.

Method: 5

Plant Used: Babul (*Acassia catechu*)

Plant Part Used: Soft stem (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem and also provides a good tongue cleaner.

Method: 6

Plant Used: Guava (*Psidium gujava*)

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth and Gum problem and also provides a good tongue cleaner.

Method: 7

Plant Used: Ber (*Zyziphus jujuba*)

Plant Part Used: Soft stem (*Datuan*)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth diseases and also provides a good tongue cleaner. After wash used taped water for kulla. It barks also used after boiling for mouth cleaning.

Method: 8

Plant Used: Mahua *(Madhuca indica)*

Plant Part Used: Soft stem (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem especially payria.

Method: 9

Plant Used: Sinduaar

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem and also solves the problem of wound in tongue.

Method: 10

Plant Used: Khajor (*Phoenix dectylifera*)

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem.

Method: 11

Plant Used: Bar (*Zyziphus jujuba*)

Plant Part Used: Soft stems (Datuan) and Gond

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem. It gond is used when you suffer toothache.

Method: 12

Plant Used: Pipal (*Fycus religiosa*)

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth problem.

Method: 13

Plant Used: Bughradi

Plant Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as herbal toothbrush. It solves the all kind of mouth and tooth heals problem.

Method: 14

Plant Used: Futbul

Plat Part Used: Soft stems (Datuan)

Method of Use: Used this soft stem for teeth cleaning as a herbal toothbrush and the juice of stem is stayed for 5-10 min in mouth. It solves the all kind of mouth problem especially teeth pain.

Method: 15

Plant Used: Turmeric (Curcuma amada)

Plant Part Used: Rhizomes

Method of Use: Make a Hukka of Haldi and the flames are inhaled into the mouth and kept 1-2 minutes. It solves the teeth ache problem.

Worm

Plant Used: Aswagadha (Withania somnifera)

Plant Part Used: Whole plant

Method of Use: Crushed the plant and juice should be taken.

WOUND

Method: 1

Plant Used: Narjok

Plant Part Used: Root

Method of Use: Grind the sun-dried root of *Narjok* and mix with pure mustard oil. Apply the prepared medicine 2 times daily.

Method: 2

Plant Used: Neem (*Azadirachta indica*)

Plant Part Used: Bark

Method of Use: The dried bark is boiled in one glass of water. The wound is washed every morning and evening to the boiled *neem* water.

IK-Veterinary Care **(Plant Based)**

S.No.	Medicinal Plants	Traditional Use	Source
1.	Sweet Basil *(Ocimum basilicum)*	Dried leaf powder of sweet basil is used for removing lice from the body of livestock.	Panchu Oraon, Jahurhan Lohra, Charia devi, Rami Devi, Hua Oraon and Kali Oraon. Vill.-Kotta
2.	*Lajwanti (Mimosa pudica)*	Paste of lajwanti plant is applied as cure for swelling of leg of cattle.	Jawra Oraon, Usia Oraon, Bhikha Oraon, Bude Oraon and Kunwar Oraon Vill.-Kotta.
3.	4O'Clock Plant *(Mirabilis jalapa)*	Dried powder with kujri *(Celastrus paniculatus)* seed oil (2:1) is used for treatment of septic wounds of cattle.	Charku Oraon, Hondra Oraon, Mangru Oraon, Divya Oraon and Jala Oraon Vill.-Kotta
4.	Sponge Gourd *(Luffa cylindrica)*	Fumes (made of dried fruits after burning) is used for treatment of cough and cold in cattles.	Bigal Oraon, Tulia Lakra, Dihdu Tirkey, Charo Kacchap and Umesh Tirkey Vill.-Tigra
5.	*Arandi (Justica adhatoda)*	Thr root bark decoction of arandi with paste of black pepper (5:2) is given to cattle for safe discharge of foetus after dilevery	Mains Phos Dugga, Chuda Oraon, Temba Oraon Londa Oraon, Peri Oraon and Prabhu Oraon Vill.-Buchidari
6.	China Rose *(Hibiscus chinensis)*	Decoction of flowering buds (50ml) is given to cattle for good growth of foetus	Biga Oraon, Koja Oraon, Guja Oraon, Chidni Devi, Kadi Oraon and Sauw Oraon Vill.-Tigra-Buchidari
7.	*Amaltas (Cassia fistula)*	The dried seed powder of amaltas with lime (5:3) is used for treatment of swelling of throat of cattle	Suka Oraon, Ueru Oraon, Londa Oraon, Charwa Oraon and Dalia Oraon Vill.-Tigra-Buchidari

8.	Prickly Mexican Poppy *(Argimone mexicana)*	Plant juice of Mexican poppy with paste of onion (3:1) is used for killing parasitic insects on bodies of domestic animals	Ram Kumar Mahto, Bhola Mahto, Prakash Mahto, Ram Lakhan Mahto and Kedar Mehto Vill. -Guru
9.	*Kadam (Anthocephalus chinensis)*	•Decoction of Kadam stem bark, about 15 ml, is given to animals in dyspersia. •Wood of kadam is used for making comb for removing lice from cattle body	Ghasia Oraon, Suresh Oraon, Bande Oraon, Mutha Oraon and Ratia Oraon Vill.-Jamuntoli
10.	*Rice Bran/Haria(rice Beer)*	Pigs are fed boiled rice bran and residue of rice beer is rich source of carbohydrate and minerals.	Mustari Khatoon, Birsa Munda, Mohan Munda, Madan Munda, Abdul Majid and Bigan Munda Vill.-Kamta
11.	Jackfruit, *Gular* and *Ber*	Goats are fed with leaves of jackfruit, gular and ber during scarcity period of green grases in grazing land and in kid birth, increases milk production	Dineshwar Mahto, Azhar Ansari, Gul Mohammad Ansari and Abdul Wahid Ansari Vill.-Kamta
12.	Linseed cake and *Gur*	Lactating cows and buffalows are provided linseed cake and gur which provides essential elements and energy that increases milk yield	Bigan Munda, Rajeshwar Pahan, Basanti Devi, Mohan Munda and Fagnu Munda Vill.-Kamta
13.	Bamboo Off-shoots *(Bamboosa Spps.)*	Cows and Buffalows in anoestrus condition are fed one to two pieces of bamboo off-shoots which induces heat in animals	Bande Oraon, Yamuna Oraon, Vijay Oraon, Jitia Oraon and Fagu Oraon Vill.-Jamuntoli
14.	Wheat *(Estivum sativa)*	In anoestrus condition cows and buffalows are fed 1kg sprouted wheat daily for 8-10 days, which induces heat in the animals	Han Oraon, Biswa Oraon and Habibul Ansari Vill. -Bhonda

15.	Mustard cake (*Brassica compestris)*	In anoestrus condition cows and buffalows are fed with 1 kg of mustard cake for 10-15 days which induces heat in animals.	Bande Oraon, Durga Oraon, Jitia Oraon, Bandhan Oraon, Ram and Mange Oraon
16.	*Dhania, Jeera and Bhahg*	To control diorrhoea in animals like cattle and buffalow 10g dhania, 10g jeera and 20g of bhang are grinded and mixed with water and fed to the animals.	Hundra Oraon, Atto Oraon, Mangra Oraon, Charia Devi, Birsa Tirkey, Suka Oraon and Daya Oraon Vill. -Garia Toli
17.	Tobacco Leaf *(Nicotiana tobacum)*	For control of lice and tick in cattle 250g of tobacco leaves are boiled in 1lt. of water, which is applied to the animals body after cooling.	Bandhan Oraon, Jitia Oraon, Vijay Oraon, Mange Oraon, Ramesh Oraon and Durga Oraon Vill. -Jamuntoli
18.	Neem Leaves *(Azadirachta indica)*	For control of lice and tick in cattle 250g neem leaves are boiled in 1lit. of water after cooling is applied throughout the body of the cattle	Bande Oraon,Moga Oraon,Mange Oraon, Fagu Oraon, Durga Oraon, Ramesh Oraon and Jitia Oraon Vill. -Jamuntoli
19.	*Chir-chiti (Achyranthes aspera)*	Fresh seed paste of *chir-chiti,* with *pipla (Pothos scandens)* fruit paste is given to cattle in the treatment of mad dog biting	Jharia Devi, Jeetu Oroan, Rama Oroan and Sattar Ansari Vill. –Kotta
20.	*Mango (Mangifera indica)*	Smoke (made by burning dried leaves) before cows against *"kirkit"* (swelling of throat) in winter season.	

IK-Veterinary Care (Disease Based)

Semla

Method: 1

Plant Used: Tremendous (*Tremendous indicus*)

Plant Part Used: Fruits

Ingredients: Salt

Method of Use: Use tremendous and salt mixture for scrubbing on tongue. It solves the all kind of mouth problem.

Foot and mouth disease

Method: 1

Plant Used: Bhelwa

Plant Part Used: Seeds

Ingredients: Karanj oil

Method of Use: Grinded the seeds of Bhelwa and mix in the Karanj oil and use for massage on infected foots of animal.

Method: 2

Plant Used: Karanj *(Pongamia pinnata)*

Plant Part Used: Oil

Ingredients: Ash of cycle tyre, Carbon of dry Cell, Kapoor,

Method of Use: Ash of cycle tyre 100 g, Carbon of dry Cell 100 g, Kapoor 5 g, Karanj oil 250 g, mix all the ingredients and use as a paste for massage on infected foots of animal.

Source: Kasim Ansari
Vill+ PO- Kuli, Bedo,
Ranchi

Fever

Method: 1

Plant Used: Raksa Pumpkin, Wild onion, Bavadhi,

Plant Part Used: Bark of Raksa Pumpkin, Rhizomes of Wild onion and Bavadhi,

Ingredients: Black salt

Method of Use: Grinded the all plant parts and mix few amount of black salt and use for feed.

Source: Kasim Ansari
Vill+ PO- Kuli, Bedo,
Ranchi

Bone Fracture

Method: 1

Plant Used: Hathjor (Martynia annua)

Plant Part Used: Hole plant,

Method of Use: Grinded the plant parts and use for plaster on broken parts of body, after plaster use small size bamboo for tighten this parts..

Source: Lalshankar Singh
Vill- Chankopi, PO- Khukhra, Bedo, Ranchi

Mouth Swelling

Method: 1

Plant Used: Bandar Lavari,

Plant Part Used: Fruits,

Ingredients: Water

Method of Use: Grinded the fruits of plant and mix in water and use for massage on infected parts of mouth.

Source: Kasim Ansari
Vill+ PO- Kuli, Bedo,
Ranchi

Wound

Method: 1

Plant Used: Kanaila, Masaudha,

Plant Part Used: Fruits,

Ingredients: Mustard oil

Method of Use: Grinded the fruits of plant and mix few amount of mustard oil and use for massage on wound.

Sterility

Method: 1

Plant Used: Red stone pumpkin,

Plant Part Used: Fruits (found in roots),

Method of Use: Use the Red stone pumpkin for feed, it solve the problem of sterility.