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Identification of natural resources at watershed level: an initial step of mainstreaming of the Federal restructure in Nepal[1P]

Madan Koirala[2]

Abstract

Federal restructuring of the nation state has become almost common agenda after April 2006 revolution in Nepal. Political parties, ethnic communities, development planners have started to move towards federal direction in their understandings. Expectation revolution of people is ahead of other issues such as institutional framework and working processes. Identification of extractable natural resources meant for the livelihood of local people becomes the basic requirement to meet these expectations.

Koshi, Gandaki and Karnali three broad watershed level ecosystem-mapping especially forest ecosystem and agroecosystem reveal a basic inventory for the livelihood support of the people. Modernizing agriculture, followed by Non Timber Forest Products processing is a viable venture in Koshi, followed by tourism and horticulture in the Gandaki watershed. Likewise, Karnali watershed reveals the possibility of organic farming, horticulture and rare medicinal plants for the livelihood support. Niche specific biodiversity resources inventorization at village level will add the self-sufficiency relieving the pressure on the central governments.

1.0 Introduction

April 2006 people's movement in Nepal has set a common understanding in the inclusive restructuring of the nation. It has been ensured with the documentation in the interim constitution promulgated in January, 2007. Federal structure is the common agenda proposed by people from different walk of life. Debate and discussion are on the way by different communities about the basis, variables, indicators of federalism. Ethnic, religious, regional, linguistic communities those were with limited or no access to the mainstream politics till to date are attempting their agenda/position clear for their proper representation in the forthcoming Constituent Assembly election. Political parties, civil society, professional organizations, trade unions, and every organized and unorganized units are cautious about the proper representation of the above communities.

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General people's aspiration for a comfortable living and access to minimum quality of life has been tremendously increased compared to the state's management capacity. Limitation on access to resources and income discrepency might have difficulty in bridging the gap between the aspiration and resource access. In such circumstances identification of extractable natural resources meant for the livelihood of local people becomes the basic requirement to meet these aspirations.

The list of natural resources might be long from academic and theoretical perspective ranging from precious minerals, fossil fuel, fresh water to niche specific unique ecosystems (forest, grassland, cultivation area etc.). However, the potentially extractable renewable resources meant to be used for the immediate livelihood of the local people are quite few. Based upon the experience of the local people and documented in conservation related literature these could be the forest ecosystem and agroecosystems. Although, water resource is used as life line of the people, it serves more as ecosystem service and the mechanism of ecosystem valuation is yet to be established in Nepalese context (EPR, 1997; NBS, 2002). There is high potentiality of hydropower generation and concerning authorities (Ministry of Water Resources, Nepal Electricity Authority etc.) are attempting for new HP projects, it involves time, technology and huge monetary resources. Similarly, Geological Map published by Department of Mines has the inventory of mineral deposition at different parts of the country. Excavation of the minerals also requires additional time, technology and monetary resources.

Major watershed level ecosystem mapping, especially forest ecosystem and agroecosystem based upon the available information might be a basic inventory for the livelihood support of the people. Koshi, Gandaki and Karnali might be considered three broad watersheds based upon different integrated and project level studies (JICA, 1988; LRMP, 1986).

Modernizing agriculture, followed by Non Timber Forest Products processing is a viable venture in Koshi watershed (NBS, 2002, NBRS, 2007). Tourism and horticulture could be dominant activity in the Gandaki watershed (Sharma 2000; NBS, 2002). Likewise, Karnali watershed reveals the possibility of organic farming, horticulture and rare medicinal plants for the livelihood support. Niche specific biodiversity resources inventorization at village level will be added the self-sufficiency relieving the pressure on the central governments (NPC, 2007).

2. Population distribution at ecoregion level

Trend of population distribution at ecoregion level over three census periods viz. 1981, 1991 and 2001 show decrease in Mountain and hills and concentration in Tarai (Table 1). Western administrative zone is the least and central highest populated zone out of the five. Population pressure that was higher in 1981 census year in hills is reverting in the later census years 1991 and 2001 towards Tarai.

However, the relative growth rate is higher in Tarai compared to the rest two ecoregions and has remained higher in comparison to the national annual growth rate. Average annual growth is increasing in mountain and hills whereas the annual growth in Tarai in three census intervals shows decreasing trend (Table 2).

Table. 1 Percentage distribution of total population in different, ecological & development regions of Nepal, 1981-2001

Ecological zones & development regions	Percentage distribution		
	1981	**1991**	**2001**
Mountain	**8.7**	**7.8**	**7.3**
Eastern	2.3	1.9	1.7
Central	2.8	2.5	2.4
Western	0.1	0.1	0.1
Mid western	1.6	1.4	1.3
Far western	1.9	1.8	1.7
Hill	**47.7**	**45.5**	**44.3**
Eastern	8.4	7.7	7.1
Central	14.0	14.5	15.3
Western	14.3	13.1	12.1
Mid western	6.9	6.6	6.4
Far western	4.0	3.6	3.5

Tarai	**43.6**	**46.7**	**48.4**
Eastern	14.1	14.4	14.2
Central	15.9	16.4	17.0
Western	6.4	7.2	7.6
Mid western	4.4	5.0	5.3
Far western	2.8	3.7	4.3

Source: Population Monograph of Nepal, 2003

Table 2. Population growth rates by eco-zones

Period	Average annual growth 1961-2001			
	Mountain	Hill	Tarai	Total
1961-1971	-	-	2.39	2.05
1971-1981	1.35	1.65	4.11	2.62
1981-1991	1.02	1.61	2.75	2.08
1991-2000	1.57	1.97	2.62	2.25

Source: Population Monograph of Nepal, 2003

3. Resource use in different restructuring modalities:

Debate on the restructuring of Nepal has been opened and is being intensified with the announcement of Constituent Assembly Election date. Ranging from the historian, political thinker and analysts, regional planner, resource economists, ethnicity, religious perspective community people are joining the debate. Kandel (2007), in his book *Restructuring nation and question of federalism* suggests federalism is not favourable for Nepal case. Kandel rather states that centralism öutweighs the federal structure in Nepal based upon the economic limitations, unhealthy competition between the federal units for resources such as revenue, disintegration of sovergienty, costly for maintenance, misuse of developed infrastructure, geographical inaccessibility, weak centre, relatively smaller size, and decentralization has not been unsuccessful yet. Neupane (2000) in his *Nepalko Jatiya Prasna* book has suggested for federal restructuring based upon historical background, geographical feasibility, linguistic and ethnicity. Baral (2004) also follows almost Neupane's basis for the federal restructuring of Nepal. Rather he emphasises more on ethnic restructuring and has not taken account of natural resource base economic/livelihood.

Sharma (2006), suggests three basis for the federal restructuring of any geographical unit along with ensuring democracy, people's sovergienty and development. First, is the ethnic

and linguist basis. It has two aspects: first one is the forward looking ehtnic identity and inclusive development. Second aspect is the coordination between ethncity and class. Ethnic awareness can only be forward linking only when it is communicated with the class based awareness.

Second basis for the identification and formulation of federal structure is the economic viability and capability. Sufficient natural resource, self sufficiency in local production, niche specific productivity could be the basis for sustainability and strengthening of federal structure. Full autonomity of a federal state could be attained only through the economic stability. Niche specific natural resource can only ensure the economic stability.

Third basis for the federal restructuring in Nepal is the inter region (federation) supplementary exchange of the economy. This economy is again based upon the natural resources. Sharma's proposes about the autonomity of the local administrative units (district and villages). Autonomity must ensure the right on the use of natural resource of the geographical boundary.

Misra (2004), in his article *restructring of nation* suggests in strengthening the ground level tiers of the state by intensifying the political work of the local community. Based upon the political intensification, local village and ward units need to be empowered for mobilization of the local means and resources such as handling school, land management etc. Right over the local natural resources should be assigned to the local ward and village committees. A fraction of revenue generated through mobilizing local natural resources need to be sent to the central and regional units and larger chunk need to be used at local level. He recommends that resource rich area should share the resources with poor areas to trade off the resource crunch at local level. Principle of resource sharing is applicable from local ward unit to federal unit.

Lawoti (2004), suggests that the proportionate distribution of the means and resources might be a compensatory measure to the indigenous and/or ethnic communities suppressed from historical period and address economic, political and social problem to some extent. He adds that consent should be taken with the indigenous people while making use of the natural

resources (forest, mineral, water bodies), assoicated with the land owned by them or their ancestors. Right need to be ensured in the traditional ecological knowledge of the indigenous people.

Chaudhari (2007) explains that the migration to Madhes was initiated for comfortable settlement and enhance agricultural production. Ananda (2004) blames that colonialism has been imposed by the rulers by different names either by settlement or resettlement companies, or setting up of landless management commission, rehabilitation of political sufferer or setting up of villages/settlement in the name of royalties and the only affected from the land resource are the Madhesis.

Roka (2007) in his paper of *Economic concept on Federal restructure* warns that the resource used by the power center (either located in the political or administrative capital) need to be properly distributed to the remotely located geographical regions. He states availability of the natural resources in a specific site alone doesn't ensure the development of human resources. Rather the proportionate distribution of natural resources ensures the development. Thus restructuring need to follow the principle of national minimum while distributing the means and resources among and between the federal units.

4. Natural resources in Nepal:

Nepal embodies all three types of natural resources as categorized by the conventional classification: Green (forest and agriculture), grey (minerals), and white (fresh water).

A simplified ecological picture of Nepal vegetation based upon climax or near-climax vegetation type counts 36 categories. However, this classification is an average of near ecological boundary. Out of the 6,000 vascular plant species found in Nepal, about 550 species and subspecies have food value and 200 are cultivated species. The climatic and physiographic differences and prevalent tradional animal husbandry system has favoured for great diversity in indigenous livestock breeds in Nepal. Twenty-four breeds of cattle, buffalo, sheep, goat, pig and poultry are recognised and the strains within each breed is yet to be identified. Atleast 17 species out of those are indigenous.

Geological survey of Nepal has reported the following minerals in extractable quantity in different parts of Nepal.

Table 3. Mineral deposits, its location and quantity

Mineral type	Location	Extractable quantity
Iron	Phulchoki	4-6.80 million Tonnes
	Ramechhap, Chitawan, Makwanpur, Nuwakot and Pyuthan	
Limestone	Chovar hill	15.3 Megatonnes
	Bhaise, Makwanpur	8 Megatonnes
	Udayapur	70 Megatonnes
	Dhankuta, Dang	
Copper	Tanahu, Bajhang, Myagdi, Dhankuta, Taplejung	
Talkstone	Baglung, Udayapur	
Marble	Kathmandu, Makwanpur and Morang	
Slate	Tanahu, Kaski, Baghang, Dhading	
Gold	Kaligandaki, Marsyangdi, Bhudigandaki and Sunkoshi rivers	
Nickel	Sindhupalchowk, Ramechhap and Dhankuta districts	
Magnesite	Dolkha	
Natural gas	Kathmandu valley	
Coal	Dang, Salyan, Kailali, Chitawan	
Petrol	Mustang, Dailekh, Salyan, Pyuthan, Surkhet, Jhapa and Morang	

Source: Geological Survey of Nepal

Mineral based industries such as cement, marble, lime, oriend magnesite etc are in operation. A number of precious minerals are being excavated and processed by few private companies.

Approximately 6,000 rivers and rivulets with a total drainage area of about 194,471 km2 flow through Nepal of which 76% of this drainage is conducted within Nepal. Despite the higher proportionate (83,000 MW) and extractable (43,000 MW) hydropower potential, installed HP till 2006/07 is 560 MW only. Compared to the increasing yearly demand of electricity by 50 MW+ projects near completion and operation are fairly less. With the available fresh water resources 66% of total irrigable land (11,68,144 ha) area is irrigated.

There are different form of natural resources, to be used for the development in context to the federal restructuring of Nepal, present paper is limited to the green resources (forest and agroecosystem) only. Available literature of land use at ecosystem level is explained at physiographic or administrative zone. An ideal delineation of the ecosystem at watershed level will not be possible, hence, it will be a nearby identification of the forest and agroecosystem classification at watershed level.

5. Identification of green natural resources at watershed level

5.1 Forest ecosystem

Dobremz (1976) classification for the biogeographic division of Nepal is somewhat close to the three watershed level (Koshi, Gandaki, Karnali) delineation. Four biogeographic regions have been identified by him.

a. Eastern Nepalese Biogeographic Region
b. Central Nepalese Biogeographic Region with a sub-region on the northenr side
c. Western Nepalese Biogeographic Region with a sub-region on the northern side
d. Trans- Himalayan Biogeographic Region

Eastern Nepalese Biogeographic Region consists of the Arun and Tamor watersheds in the mountainous region and the eastern Tarai lying towards the east of the Saptakoshi river. This area is dominated by eastern Himalayan vegetation and flora in the sub-tropical, temperate and sub-alpine zone while the Tarai represents a north-west extension of the south-east Malaysian floristic province. The line of divide between the eastern and central Nepalese biogeographic region may be set along the Milke-Jaljale mountain ridge starting from Makalu (8463m) to the junction of the rivers Tamor, Arun and Sunkoshi. Then, the divide may follow the Saptakoshi to the Nepal-India border. The area lying from climatologically humid to per-humid region receives full force of the summer monsoon. Species of shrubby dwarf rhododendrons in the alpine zone and tree rhododendrons in the sub-alpine zone are characteristic. The temperate zone is rich in hydrophilous evergreen oaks and laurels. The sub-tropical zone has an abundance of *Schima-Castanopsis* spp. The tropical zone has a number of east Himalayan species such as Cycas pectinata, Pandanus nepalensis, Gnetum montanum and tree ferns.

The Central Nepalese biogeographic region lies between the river Kali Gandaki and the Milke-Jaljale ridge. Most of the area is drained by the Sunkoshi, Bagmati and Narayani rivers. Lying towards the western end of central Nepal, i.e, the Pokhara-Baglung area on the south of the Annapurna an Dhaulagiri Massif, this region receives heavy rainfall and is akin to the Arun and Tamor valleys of eastern Nepal. However, the intervening region shows a great deal of interpenetration between eastern Himalayan humid vegetatin and western Himalayan drier vegetation. Eastern Himalayan effects still dominate the area while western Himalayan vegetation, characterized by chir pine and blue pine, takes over soon after human intervention. Forests of evergreen oaks and laurels remain dominant in the temperate zone while the sub-tropical zone is characteristically *Schima-Castanopsis*. *Castanopsis* is less abundant compared to the forests of eastern Nepal. The Tarai has mesphilous sal forests and eastern Himalayan species quickly peter out in central Nepal. The central Nepalese biogeographic region has a series of dry inner valleys that are sheltered from the full force of the monsoon. Rolwaling valley (Dolkha), Langtang valley (Rasuwa), Shiar Khola valley (Gorkha) and the upper Marsyangdi valley (Manang) fall in this region. These valleys remain typically dry and yet rich in biological species.

Western Nepalese Biogeographic Region is the broadest with large mountainous region drained by the Mahakali, Karnali and Gandaki rivers. A large part of western Nepal has a drier climate with preponderance of conifers from the sub-tropical to sub-alpine zone. Most of the area is sub-arid and sub-humid. Winer rain prevails to some extent. Tropical forest remains dry and loses most eastern Himalayan species in the flora. The northern part of this western region is referred to as the Humla-Jumla region by Stainton (1972). This region is partially sheltered from the monsoon due to high ridges of about 4000-5000 m running east to west. Most of the country is characterised by western Himalayan coniferous forest with greater abundance of blue pine, spruce, cedar and cypress than anywhere else in Nepal. Forests of *Pinus roxburghii* and *Quercus* are widespread elsewhere, are greatly reduced in this region.

Trans-Himalayan Biogeographic Region lies towards the north of the main mountain crest of Annapurna-Dhaulagari chain. Most of the vegetation is composed of scarce and scattered

patches of throny cushion plants (*Caragana, Astragalus, Lonicera*). Sheltered places have junipers and blue pine while moist ravines and riverbanks have poplars and seabuckthorn.

Natural Resource Management Sector Assistance Programme (2002) of Ministry of Forests and Soil Conservation has corresponded IDs to the previously identified 35 forest types by various authors as per the Tree Improvement and Silviculture Component. It is published in the Ecological Map of Nepal both on ecoregion and development region basis. The map gives basis for the watershed level classification of different forest types.

Table 4: Summary of Stainton classification of 35 forest types and its correspondence with TISC ID

Stainton, 1972		**TISC, 2000 ID**	
		Forest types	
1.	Sal forest	6231	Lower Tropical Sal and Mixed Broadleaved Forest
2.	Tropical Decidious Riverian Forest	6131	Hill Sal Forest (Riverine habitat)
3.	Tropical Evergreen Forest	6131	Hill Sal Forest
4.	Sub-tropical Evergreen Forest	5034	Eugenia-Ostodes Forest
5.	*Terminalia* Forest	6131	Hill Sal Forest
6.	*Dalbergia sisoo-Acacia catgechu* Forest	6231	Lower Tropical Sal and Mixed Broadleaved Forest
7.	Sub-tropical Deciduous Hill Forest	6131	Hill Sal Forest
8.	*Schima-Castanopsis* Forest	5033	*Schima-Castanopsis Forest*
9.	Sub-tropical Semi-evergreen Hill Forest	5033	*Schima-Castanopsis Forest*
10.	*Pinus roxburghii* Forest	5011	Chir Pine Forest
		5021	Chir-Pine-Broadleaved Forest
11.	*Quercus incana-Q.lanuginosa* Forest	4231	Lower Temperate Oak Forest
12.	*Quercus dilata* Forest	4231	Lower Temperate Oak Forest
13.	*Quercus semecarpifolia* Forest	4131	Temperate Mountain Oak Forest
		4134	Mountain-Oak Rhododendron Forest
		3231	Sub-alpine Mountain Oak Forest
14.	Castanopsis tribuloides-C.hystrix Forest	5033	*Schima-Castanopsis* Forest
15.	*Quercus lamellosa* Forest	4235	East Himalayan Oak-Laurel Forest
16.	*Lithocarpus pachyphylla* Forest	4132	*Lithocarpus* Forest
17.	*Aesculus-Juglans-Acer* Forest	4233	Deciduous Walnut-Maple-Alder Forest
18.	Lower Temperate Mixed	4136	Mixed Rhododendron-Maple

	Broadleaved Forest		Forest
19.	Upper Temperate Mixed Broadleaved Forest	4135	Deciduous Maple-Magnolia-Sarbus Forest
20.	*Rhododendron* Forest	4133	*Rhododendron* Forest
21.	*Betula utilis* Forest	3131	Birch-Rhododendron Forest
22.	*Abies spectabilis* Forest	3111	Fir-Blue Pine Forest
		3211	Fir Forest
		3221	Fir-Oak-Rhododendron Forest
23.	*Tsuga dumosa* Forest	3222	Fir-Hemlock-Oak Forest
24.	*Pinus excelsa* Forest	4111	Upper Temperate Blue Pine Forest
		4221	Mixed Blue PIne-Oak Forest
25.	*Picea smithiana* Forest	4114	Spruce Forest
26.	*Abies pindrow* Forest	4122	West Himalayan Fir-Hemlock-Oak Forest
27.	*Cedrus deodara* Forest	4212	Cedar Forest
28.	*Cypressus torulosa* Forest	4213	Cypress Forest
29.	*Larix* Forest	3212	Larch Forest
30.	*Alnus* Forest	5033	*Schima-Castanopsis* Forest
31.	Populus ciliata woods	3002	Trans-Himalayan Lower Caragana Steppe (Riverine habitat)
32.	Hippophae Scrub	3002	Trans-Himalayan Lower Caragana Steppe (Riverine habitat)
33.	Moist Alpine Scrub	2231	Moist Alpine Scrub
34.	Dry Alpine Scrub	2211	Dry Alpine Scrub
35.	Juniper wallichiana Forest	4112	Temperate Juniper Forest

Source: Forest and Vegetation Types of Nepal, 2002

Protected areas as of today that includes nine national parks, three wildlife reserves, one heritage reserve, three conservation areas, and 11 buffer zones convering 19.67% of the country's land area also represent different watershed and ecological zones.

5.2 Agroecosystems

About 21% of the total land area of Nepal is used for cultivation, and the principal crops are rice (45%), maize (20%), wheat (18%), millet (5%), and potatoes (3%), followed by sugarcane, jute, cotton, tea, barley, legumes, vegetable crops and fruit. Crops such as rice, rice bean, eggplant, buckwheat, soybean, foxtail millet, citrus and mango have high genetic diversity relative to other food crops. Crop species in Nepal owe their variability due to the presence of about 120 wild relatives of the commonly cultivated food plants and their proximity to cultivated areas.

High degree of agroecological diversity in Nepal is assoicated with the hills and mountains, where variations in factors such as topography, slope, aspect and altitude allow for an enormous range of biological environments, climatic regimes and varied ecosystems (Table 5). This is the reason, that the farming systems vary according to the three major physiographic regions namely Tarai, the Mid-hills and the mountains. The physiography based and niche specific cropping patterns, major landraces of important food crops and the crop diversity present in each ecological zone reveal that primitive cultivars of speciality cultigens and crop landraces are the major building blocks of traditional farming systems. It suggests that the promotion and continued existence of traditional farming systems are essential for agrobiodiversity conservation in Nepal.

Agricultural biodiversity is vital to marginalized mountain communities for maintaining food security. This is apparent from the 172 families, 294 genera, and 551 species/subspecies of agricultural crops that are grown in the Himalayas. Out of more than 500 plant species that are edible, 200 are cultivated. Crop variety dynamics in Nepal are important. Rice is cultivated in diverse environments. Farmers in Nepal grow more than 95 local aromatic and fine rice landraces.

Table 5: Crop diversity in selected ecological regions of Nepal

Ecological region	Crop diversity (tentative)
Siwalik Hills and Tarai (hot, humid and dry)	Rice, Kodo (millet), chickpea, pigeon pea, lentil, jute, niger, sesame, Brassica species, Perilla, wild relatives of rice, eggplant, okra, mango, jackfruit.
Eastern and Central Himalaya (cool and humid)	Rice, maize, covered barley, foxtail millet, buckwheat, barley, rice, bean, finger millet, blackgram, soybean, field peas, niger, Perilla, sesame, Brassica species, wild relatives of buckwheat, pigeon pea, citrus fruit
Western and Far-Western Himalaya (cool and dry)	Cold tolerant rice, proso millet, wheat, naked barley, maize, buckwheat, amaranths, chenopods, rice bean, blackgram, soybean, field peas, radish, niger, sesame, Brassica species, Perilla, wild apple, wild pear, walnut.

Source: Nepal Biodiversity Strategy, 2002

Horticultural diversity is not well documented in Nepal. Table 6 gives an overview of agro-climatic niche-based selection of fruit crops in the districts of Nepal. Fruits are grown in all 3 watersheds , however the types differ depending upon agro-ecological zones.

Table 6: Agroclimatic niche-based selection of fruit crops in the districts of Nepal

Fruit	Districts
Citrus fruit	Dhankuta, Bhojpur, Terathum, Sankhuwasabha, Panchthar, Ilam, Sindhuli, Ramechhap, Dhading, Kabhrepalanchok, Gorkha, Lamjung, Tanahu, Syangja, Kaski, Palpa, gulmi, Salyan, Dailekh, Dadeldhura
Apple	Solukhumbu, Sindhupalchok, Rasuwa, Mustang, Jumla, Kalikot, Dolpa, Rukum, Doti, Baitadi, Darchula
Banana Pineapple	Kabhrepalanchok, Dhading, Nuwakot, Sarlahi, Dhanusha, Mahottari, Chitwan, Dhading, Nuwakot, Sarlahi, Chitwan
Mango	Bara, Parsa, Rauthat, Sarlahi, Mahotarri, Dhanusha, Sunsari, Sirha, Saptari, Chitwan, Kapilbastu, Nawalparasi, Rupandehi, Surkhet, Dang
Walnut	Jumla, Kalikot, Bajhang, Darchula, Baitadi, Dolpa, Rukum
Pear	Dhankuta, Bhaktapur, Lalitpur, Kabhrepalanchok, Dhaking, Makawanpur, Sindhupalchok, Nuwakot, Rasuwa, Palpa
Grape	Banke, Bardia, Manang, Mustang

Source: Nepal Biodiversity Strategy, 2002

Clmatic and physiographic differences and traditional animal husbandry systems has prevailed great diversity of indigenous livestock breeds in Nepal. Twenty-four breeds of cattle, buffalo, sheep, goat, pig and poultry are recognised (Table 7). However, the strains within each breed have yet to be recognised. Among known breeds, pure *Siri* cattle have been extincted, *Lulu and Achhame* are on the verge of extinction, *Lime* buffalo is endangered, *Lamphuchhre* and *Kage* sheep are at risk, *Bampudke* pig is on the verge of extinction while *Chwanche* and *Hurrah* pigs are only seen in small numbers. Breeds and strains of domestic animals, including poultry, in different ecological belts are yet to be identified and characterised.

Table 7: Indigenous livestock genotypes in Nepal

Agroclimatic Region	Altitude (m)	Llivestock	Indigenous Genotypes
Trans-Himalaya/High Himalaya	> 2,500	Cattle Goat Sheep	*Yak, Lulu* *Chyangra* *Bhyanglung, Baruwal*
High Mountains	2,200-4,000	Cattle Goat Sheep	*Yak, Kirko* *Sinhal* *Dhorel, Baruwal*
Mid-Hills	800-2,400	Buffalo Goat Sheep	*Lime, Gaddi* *Khari* *Kage, Baruwal*

Lower Hills/Siwalik Hills	300-1,500	Cattle Buffalo Goat Sheep Pig Poultry	*Hill cattle, Achhame* *Parkote* *Khari* *Kage* *Chwanche* *Bampudke* *Sakini*
Tarai	<300	Cattle Buffalo Goat Sheep Pig	*Tarai cattle* *Tarai buffalo* *Tarai goat* *Lampuchhre* *Hurrah*

Source: Nepal Biodiversity Strategy, 2002

The selection and distribution of various indigenous types of animals raised in different parts of the country are guided by socio-economic values and ethnocultural preferences, climate, animal husbandry systems and in some cases, marketability. Indigenous breeds crossed with matching with exotic genotype can contribute in profit maximization and marketability as the present practice is limited for subsistence only.

5.3 Natural resource at watershed level

Different organizations (Department of Forest, Department of Watershed and Soil Conservation, Department of Plant Resources, Department of Agriculture, Nepal Agriculture Research Council, Tribhuvan University, Kathmandu University, Nepal Academy of Science and Technology) and workers have worked on the identification and inventory of green natural resources at different boundary level. Ecological map of Nepal (2002) gives an overview of forest categories at landscape level. Overlay of the map at watershed level gives representative idea of forest types at watershed level. Available information on agroecosystems types, crop varieties and cropping pattern overlayed with watershed gives vivid picture of agroecosystems.

Available infrastructure and facilities facilitate Koshi watershed to enhance the yield in cereals, fruit, tea, livestock with few sites of tourist importance. Similarly, Gandaki watershed could be focussed for tourism sites such as Annapurna Conservation Area, Langtang, Manasalu along with fruit and vegetable production. 2007-2009 medium term interim plan approach paper of Nepal Government has proposed the Seti, Mahakali, Rapti

and Karnali zone as herbal medicine promotion zone. It has high potential of organic farming, raising NTFPs and important medicinal herbs and high value fruits.

6. Conclusion

Constituent Assembly Election to be held on November 22, 2007 will be a means to address many socio-political-ethnic and economic issues. However, availability of resource becomes prerequisite to meet the growing aspirations of the people. Use of water and mineral resources for the development of the region and country as a whole requires additional capital, time and technology. Whereas the aspiration of the majority of the population is to meet the immediate requirements. An inventory, indexing and accounting of the natural resources principally forest and agroecosystems can meet the immediate requirements of the majority of the population. In this context, an immediate resource mapping initiative mobilizing the available database of the existing institutional set ups can help to avail the information on extracting natural resources at sustainable level.

Niche specific inventory and indexing of the resources with value addition through processing technology becomes an added advantage to the qualified professional and revenue generation of the country.

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