Environmental Impact Assessment (EIA)

Of

Sustainable Harvesting Plan of Jatamasi in Humla District

Submitted To:

Government of Nepal
Ministry of Forests and Environment
Singhadurbar, Kathmandu, Nepal

Through
Department of Forest,
Babarmahal, Kathmandu

Submitted by:
District Forest Office, Humla

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ABBREVIATIONS

ADO	Agriculture Development Office
CDO	Chief District Office
CF	Community Forest
CFUG	Community Forest Users Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DCC	District Coordination Committee
DFO	District Forest Office
DHQ	District Head Quarters
DIZ	Direct Impact Zone
EIA	Environment Impact Assessment

सारांश

Executive Summary in Nepali

पृष्ठभूमि

हुम्ला जिल्लामा दीगो रुपमा जटामसि संकलन गर्ने प्रस्तावको प्रस्तावक श्री जिल्ला वन कार्यालय, हुम्ला हो । यस कार्यालय हुम्ला जिल्लाको सदरमुकाम सिमिकोटमा अवस्थित छ । जिल्ला वन कार्यालयले उक्त प्रस्ताव कार्यान्वयनका लागि वातावरणीय प्रभाव मुल्यांकन अध्ययन (EIA) प्रतिवेदन तयार गरेको छ ।

नेपालमा गैह्रकाष्ठ वन पैदावारको महत्व निकै रहेको छ । वन विभागको तथ्याङ्क अनुसार हरेक आर्थिक वर्षमा लगभग ८० प्रकारका गैह्रकाष्ठ वन उपजहरूको सङ्कलनबाट वार्षिक औसत करीव २.५ करोड राजस्व सङ्कलन भएको देखिन्छ । अन्य विभिन्न अध्ययनहरूले नेपालबाट करिव १६० प्रजातिका गैह्रकाष्ठ वन पैदावार र जडीबुटीको सङ्कलन र व्यापार हुने देखिएको छ । व्यवस्थित र दीगो रूपमा गैह्रकाष्ठ वन पैदावारको सङ्कलन गर्न सकेमा वातावरणीय सन्तुलन कायम राख्नुका साथै ग्रामिण समुदायको जीविकोपार्जनमा पनि ठोस योगदान पुऱ्याउन सकिन्छ । वन उद्यमको विकासको लागि पनि गैह्रकाष्ठ वन पैदावारको सर्वेक्षण गरी स्रोत आँकलन गर्नु अनिवार्य काम भइसकेको छ । यसै परिप्रेक्षमा जिल्ला वन कार्यालय हुम्लाले जिल्लाको विभिन्न क्षेत्रहरूवाट वार्षिक ४२५ मे.ट. जटामसि संकलन गरी विक्रि वितरण गर्ने प्रस्ताव गरेको छ ।

प्रस्तावको विवरण

हुम्ला जिल्लाका अधिकाँस जनसाधारणको लागि आयको मुख्य स्रोत जटामसि संकलन हो । विगत केहि वर्षमा वातावरणीय प्रभाव मुल्यांकन तयार नभएर हुम्लामा जटामसि संकलन तथा विक्रि वितरण हुन सकेको छैन । यस समस्यालाई हृदयंगम गरी जिल्ला वन कार्यालय, हुम्लाले दीगो जटामसि संकलन योजना तर्जुमा गरेको छ, जसमा सुकेको ४२५ मेट्रिक टन जटामसि संकलन गर्न सकिने प्राविधिक अनुमान गरिएको छ ।

आयोजना क्षेत्र

हुम्ला जिल्लामा जटामसि साधारणतया ३५०० मिटर उचाई देखि ४५०० मिटर उचाई सम्मका लेकका वन तथा चरन क्षेत्रहरूमा पाइन्छ । यस्तो उचाईको क्षेत्र खास गरि चीनको सिमावर्ती गाउँपालिका तथा बाजुरा जिल्लासंग जोडिएको उल्लेखित उचाई भित्रका क्षेत्रहरूमा पाइन्छ । दीगो रुपमा जटामसि संकलन योजनामा उल्लेखित क्षेत्रवाट जटामसि संकलन गर्ने उद्देश्य बनाएको छ । तसर्थ, आयोजना क्षेत्र भन्नाले ३५०० मिटर देखि ४५०० मिटर उचाईका हुम्ला जिल्लाका सबै गाउँपालिका भित्रका क्षेत्रहरू पर्दछन् ।

वातावरणीय प्रभाव मुल्यांकन अध्ययनको उद्देश्य

वातावरणीय प्रभाव मुल्यांकन अध्ययनको प्रमुख उद्देश्य आयोजना क्षेत्रको सुरुको अवस्थाको वातावरणीय स्थितिको सूचना संकलन, पहिचान, प्रस्तुति, त्यसको स्थिति, जटामसि संकलनको क्रियाकलापको आधारमा सकरात्मक तथा नकरात्मक प्रभावहरू पत्ता लगाउने, लेखाजोखा गर्ने, तिनीहरूको स्वभाव, आकार, दुरी, र समय छुट्टयाई सकरात्मक प्रभावहरूको अभिबृध्दि र नकरात्मक प्रभावहरूलाई कम गर्ने उपायहरू प्रस्ताव गर्ने, वातावरणीय व्यवस्थापन योजना (EMP) र अनुगमन योजना तर्जुमा गरी प्रभावकारी रूपमा कार्यान्वयन गर्नको लागि मद्दत पुर्याउन र यसको माध्यमद्वारा निर्णयकर्तालाई उपयुक्त आयोजनाको विषयमा निर्णय लिन सहयोग गर्नु हो ।

वातावरणीय प्रभाव मुल्यांकन अध्ययन प्रकृया

अध्ययनको पहिलो चरण २०७४/४/२६ मा तत्कालिन जनसंख्या तथा वातावरण मन्त्रालयबाट क्षेत्र निर्धारण (Scoping) र कार्यसूची (ToR) स्वीकृत भएको थियो । त्यसपछि स्वीकृत कार्यसूची अनुसार अध्ययन प्रकृया अगाडि बढाइएको हो ।

भौतिक वातावरण

यसमा प्राप्त सेकेन्डरी स्रोतहरूको अध्ययन गरी उपयुक्त जानकारी तथा तथ्याकंहरू संकलन गरिएको थियो । जसमध्ये मुख्यतया वन विभाग, जिल्ला वन कार्यालय हुम्ला, जिल्ला समन्वय समिति (विगतको जिल्ला विकास समिति) हुम्लाबाट तयार गरिएका विभिन्न प्रतिवेदनहरू पर्दछ । यसको साथै वन तथा वातावरण मन्त्रालय (MOFE), जल तथा मौसम विज्ञान विभाग (DHM) मुख्य थिए । यी स्रोतबाट आयोजना क्षेत्रको वन, वन कार्य योजना, माटो, पानी, भौगोलिक अवस्था आदिको जानकारी लिइएको थियो । त्यसपछि आयोजना क्षेत्रको अध्ययन तथा स्थानीय जन समुदायसंगको छलफलद्वारा तथ्यांकहरू संकलन गरिएको थियो ।

जैविक वातावरण

आयोजनासंग सम्बन्धित गाँउपालिकाहरू, जि.सं.स तथा वन तथा वातावरण मन्त्रालय, वन्यजन्तु तथा राष्ट्रिय निकुञ्ज विभागबाट प्रकाशित सूचना तथा तथ्याङ्कहरू जम्मा गरिएको थियो । त्यस्तैगरी जंगली जनावर, गैह्रकाष्ठ वन पैदावरको प्रयोग र जंगलको हालको स्थिति आदिका बारे सामुदायिक वनका उपभोक्ता समूहहरू र जानकार व्यक्तिहरूबीच छलफल गरि तथ्याकं संकलन गरिएको थियो ।

आयोजना क्षेत्रमा पर्ने सम्बन्धित गाउँ-पालिका (विगतको गा.वि.स) तथा वन तथा वातावरण मन्त्रालय, वन्यजन्तु तथा राष्ट्रिय निकुञ्ज विभागबाट प्रकाशित सूचना तथा तथ्याङ्कहरू जम्मा गरिएको थियो । साथै आयोजना क्षेत्रको स्थलगत विस्तृत सर्वेक्षण गरी सूचनाहरू संकलन गरिएको थियो । यसको लागि सम्भव भए सम्मको ठाउँमा गएर सूचना संकलन गरिएको थियो । त्यस्तैगरी जंगली जनावर, गैह्रकाष्ठ वन पैदावारको प्रयोग र जंगलको हालको स्थिति आदिका बारे सामुदायिक वनका उपभोक्ता समूहहरू र जानकार व्यक्तिहरूसंग छलफल गरि संकलन गरिएको थियो ।

सामाजिक, आर्थिक तथा सांस्कृतिक वातावरण

आयोजनासंग सम्बन्धित प्रकाशित तथा अप्रकाशित प्रतिवेदनहरूको साथै जि.सं.स, जि.व.का आदिको प्रोफाइल अध्ययन गरि आवश्यक सूचना तथा तथ्यांक संकलन गरिएको थियो । आयोजना क्षेत्रको स्थलगत अध्ययनद्वारा आयोजनाबाट प्रत्यक्ष प्रभावित घरधुरीहरूको गणना गरी आवश्यक तथ्यांक संकलन गरिएको थियो । साथै, लक्षित समूह छलफल (Focus Group Discussion), मुख्य जानिफकारहरूको अन्तर्वाता (Key Informants Interview) र सरोकारवालाहरूसंग छलफल गरिएको थियो । स्थलगत अध्यननका बेला प्रकाशित सूचना तथा तथ्यांकबाट संकलन गरिएका सूचनाहरूको आधिकारीकता पुष्टि गरिएको थियो ।

प्रभावको तथ्यांक तयारी, लेखाजोखा, अनुमान र मुल्यांकन

आयोजनाबाट प्रत्यक्ष र अप्रत्यक्ष प्रभावित क्षेत्र छुट्याईएको थियो । प्रत्यक्ष प्रभावित क्षेत्र भन्नाले विगतमा जटामसि संकलन गर्न जाने गाउँका वासीहरू पर्दछन भने अप्रत्यक्ष प्रभावित क्षेत्र भन्नाले जिल्लाका सबै क्षेत्रलाई लिइएको छ । भौतिक, जैविक र सामाजिक आर्थिक तथा सांस्कृतिक

वातावरण संग सम्बन्धित तथ्यांकको प्रस्तुतिकरण सम्बन्धित बिषय बिशेषज्ञहरुबाट भएको थियो । प्रस्तुति अनुभव र दक्षताको आधारमा अनुमानद्वारा गरिएको थियो । वातावरणीय प्रभावहरूको मुल्यांकन गर्दा आयोजना क्षेत्रको वर्तमान तथ्यांकहरूलाई आधारमानी जटामसि संकलनको क्रियाकलापले त्यहाँ ल्याउन सक्ने प्रभावलाई मुल्यांकन गरी प्रत्येक प्रभावहरूको लेखाजोखा प्रत्यक्ष र अप्रत्यक्ष प्रभाव, परिमाण, प्रभावको प्रकृती र अवधीको अनुमान गर्दै गरीएको थियो । यस अध्ययानमा खासगरी प्राविधिक वा भौतिक, सामाजिक तथा आर्थिक वातावरण अन्तर्गत आउन सक्ने नकारात्मक वातावरणीय प्रभावहरूको प्रभाव कम गर्न प्रस्ताव गरीएका उपायहरूलाई अपनाउने प्रक्रियालाई प्रस्ताव गरिएको छ.।

वातावरणीय व्यवस्थापन योजना (EMP) मा सकारात्मक प्रभाव अभिवृद्धि र नकारात्मक प्रभाव न्युनिकरण गर्ने उपायहरू के, कहाँ, कसरी, कसले र कहिले गर्ने बारे स्पष्टरूपमा उल्लेख गरिएको छ । वातावरण व्यस्थापन योजना कार्यान्वयन कार्यको अनुगमन गर्नको लागि अनुगमन योजना पनि तयार गरिएको छ ।

वातावरणीय विवरण

आयोजना क्षेत्रका धेरै भागमा ठण्डी शितोष्ण र हिमाली (Temperate and Alpine) जलवायुको बाहुल्य पाइन्छ । सिमिकोटको वर्षा मापन स्टेशनबाट लिइएको तथ्यांक अनुसार एक वर्ष भरिमा ७८४ मि.मि. औषत वर्षा भएको देखिन्छ । यहाँको तापक्रम जनवरी महिनामा माइनस ७ डिग्री से. भन्दा मुनि र जुलाईमा वर्षा १५० से. भन्दा माथि सम्म मापन गरिएको छ । यहाँ जुन, जुलाई र अगस्तमा न्यानो हुन्छ भने डिसेम्बर, जनवरी र फेबअरीमा चिसो हिमपात हुन्छ । जुलाई र अगस्तमा हावाको आद्रता सबैभन्दा बढी ८६% सम्म पुग्दछ र सेप्टेम्बर, अक्टोबरमा सबैभन्दा कम ६०.५% सम्म पुग्दछ । उच्च पहाडी भागमा जाडो समयमा हिउँ पर्दछ, जसले गर्दा यहाँको जीवन कष्टकर हुन जान्छ ।

आयोजना क्षेत्रमा आयुर्वेदिक औषधि, गैह्रकाष्ठ वन पैदावर र अन्य महत्वपूर्ण वनस्पति पाइन्छ । जसको महत्व धेरै छ । ती ठाउँको लागि गैह्रकाष्ठ र आयुर्वेदिक वनस्पतिहरू त्यसमाथि पनि खास गरी जटामसि नै आयआर्जनको प्रमुख स्रोत हो । आयोजना क्षेत्रका वासिन्दाहरूमा वनस्पतिको परंपरागत प्रयोगको बारेमा राम्रो ज्ञान भएको पाइन्छ, त्यस क्षेत्रमा आधुनिक अस्पतालको राम्रो सुविधा छैन । तसर्थ त्यहाँ औषधिजन्य वनस्पतिको बारेमा ज्ञान हुन आवश्यक छ ।

आयोजना क्षेत्रमा स्तनधारी वन्यजन्तु तथा जंगली जनावरहरू पाइन्छन् । ती मध्ये आयोजना क्षेत्रमा पाइने पाँच प्रजातिका जनावर (Grey wolf, Clouded leopard, Snow leopard, Musk deer, Red panda) र दुई प्रजातिका पंछी (डाँफे र चीर) नेपाल सरकारको संरक्षित सूचीमा पर्दछन् ।

हुम्ला जिल्लाको जनसंख्या ५०,८५८ छ, जसमा ४८.६३ प्रतिशत महिला र ५१.३७ प्रतिशत पुरूष छन् । सो मध्ये ८१.६२ प्रतिशत हिन्दु र १८.१२ प्रतिशत बौध्द छन् भने अरू धर्मका अनुयायीहरू नगन्य मात्रामा छन् । यस जिल्लामा औसत साक्षरता ४७ प्रतिशत छ, त्यस मध्ये पुरूष साक्षरता ६२ प्रतिशत तथा महिला साक्षरता ३८ प्रतिशत छन् । हुम्लामा १४० वटा स्कुलहरू छन्, जस मध्ये एउटामा स्नातक तह सम्मको पढाई हुन्छ । हुम्लामा जिल्ला अस्पताल एउटा छ भने हेल्थपोष्ट् १४ वटा छन् ।

यस क्षेत्रका जनताको जीविकोपार्जनको मुख्य आधार कृषि हो । अझै पनि यस क्षेत्रमा बाली लगाउने तरिका परम्परागत छ । आधुनिक कृषि सामग्रीको प्रयोग अति नै कम छ । चरन क्षेत्र र घाँसको सहज उपलब्धता भएकाले पशुपालनको लागि यो क्षेत्रको महत्व छ । यस क्षेत्रमा पाइने मुख्य पशुहरूमा गाई,

गोरु, भैँसी, भेडा, बाखा, घोडा, चौरी, खच्चड आदि हुन् । यस क्षेत्रका जनताको नगद आयको मुख्य स्रोत जनावरको प्रयोगवाट हुने यातायात पनि हो । खच्चड र च्यांग्राहरू सामान-ओहोरदोहोर गर्नमा बढी प्रयोग भएको पाइन्छ ।

हुम्ला खाद्यान्न अपुग जिल्ला मध्येमा एक हो, तसर्थ यहाँ सुर्खेतवाट प्लेनमा चार्टर गरी खाद्यान्न ल्याइन्छ । खाद्यान्न तथा अन्य सामानहरू किन्न आवश्यक रकमको मुख्य स्रोत पशुजन्य उत्पादन तथा जडिबुटीको संकलन तथा विक्रि नै हो । यहाँका जनताहरूको दावी अनुसार यहाँ जडिबुटी संकलन त्यस माथि पनि खासगरी जटामसिवाट अति गरीवहरूले प्रति परिवार प्रति वर्ष २५ देखि ३० हजार सम्म कमाउछन् । तसर्थ यहाँका जनजीवनको जडिबुटीसंग अन्योन्याश्रित सम्वन्ध रहेको छ ।

हुम्ला जिल्लालाई यस क्षेत्रका नदि, पहाड, जंगल, हिमालले अति सुन्दर बनाएको छ जसले यात्रीहरूको मनै लोभ्याउँछ । कम जन घनत्वका कारण यहाँका गाउँ र लेकहरू अति शान्त पनि छन् । हालै भारतीय तिर्थयात्रीहरूको लागि मानसरोबर तथा कैलास जाने मुख्य द्वार हुम्लाको सिमिकोट हो । सिमिकोटवाट करिब १५ मिनेटको हेलिकप्टर यात्रामा हिल्सा पुगिन्छ भने हिल्साको सिमा पारीबाट मोटरको बाटो करिब ५ घण्टामा मानसरोवर पुगिन्छ ।

जटामसि संकलनबाट तथा जटामसि संकलनको अवधिमा हुन सक्ने सकारात्मक प्रभाव

यसका सकारात्मक प्रभाव निम्नानुसारका छन्:-

१. जटामसि संकलनको समयमा यसको संकलन, सफाई, धुवानी, सुकाई, भण्डारणवाट स्थानीय समूहहरूले रोजगारी तथा आय प्राप्त गर्दछन् ।

२.जटामसि संकलनबाट भएको सानो आम्दानीले यहाँका महिलाहरूले चियाहरू पसल राख्ने गरेका छन् भने संकलनवाट प्राप्त आम्दानीबाट ती ठाउँहरूको यस्तो पसलमा व्यापारको पनि बृद्धि भएको देखिन्छ ।

३. यस संकलन कार्यक्रम अन्तर्गत सिकाइने विभिन्न तालिमबाट यहाँका मानिसहरूको सीप अभिबृद्धि हुन सक्ने देखिन्छ ।

४. यस संकलन कार्यमा महिलाहरूको पनि संलग्नताबाट महिलाहरूको हातमा केहि रकम पर्ने तथा त्यसबाट महिलाहरूको जीविका केहि सहज हुनेछ ।

५. जिल्ला वन कार्यालय मार्फत जटामसिबाट सरकारलाई प्रति किलो २० रुपैया राजस्वको प्राप्त हुनेछ । ४ लाख २५ हजार के.जि बाट सरकारको ८५ लाख रुपैया राजस्व बृद्धि हुन्छ । यसको साथै स्थानीय निकायले पनि प्रति केजि १५ रुपैयाको दरले ६३ लाख ७५ हजार रुपैया प्राप्त गर्ने छ ।

६. जटामसि संकलन कार्यले अप्ठयारो नाकाहरूमा हिड्ने बाटो बनाउने वा बन्ने पनि गर्दछ ।

७. दीगो संकलनको परिपाटी बसे पछि जथाभावी संकलन कार्य निरुत्साहित भई कम हुने गर्दछ ।

जटामसिको दीगो संकलन गर्ने परिमाणमा बृद्धि तथा स्थानीय स्तरमा यसको प्रोसेसिङ्गवाट अझै यसको सकारात्मक प्रभाव बढाउन सक्ने देखिन्छ ।

संकलन अवधिमा हुनसक्ने नकारात्मक प्रभावहरू

भौतिक वातावरण

- संकलन कर्ताहरूले लाने र संकलन क्षेत्रमा फालिने प्लाष्टिकको झोला, सिसि, बोरा आदिबाट संकलन क्षेत्रमा भिजुएल पोलुसन हुने ।

- सरसफाई तथा खाना पकाउनको लागि उच्च क्षेत्रमा पाइने पानी दूषित हुन सक्ने ।
- संकलन कार्यवाट माटोको एक्सपोजर तथा भू-क्षय तथा धुलोवाट स्थानीय वातावरण दूषित हुन सक्ने ।

जैविक वातावरण

- दीगो रुपले संकलन नगरेमा जटामसि स्रोतको क्षय हुन सक्ने ।
- स्थानीय क्षेत्रमा पाइने जंगली जनावर तथा पंक्षीहरूलाई डिस्टर्व हुने ।
- जथाभावी रुपमा गैर कानूनी शिकार हुन सक्ने ।
- संकलन कार्यमा होसियारी नपुगेमा वरपरको काम लाग्ने जडिबुटीका प्रजातिहरूलाई हानी हुन सक्ने ।
- खाना पकाउने तथा अन्य कार्यबाट वन तथा चरनमा आगो लाग्न सक्ने ।
- संकलकहरूको अपुग होसियारीवाट वन तथा चरन क्षेत्रको जैविक विविधता नाश हुन सक्ने ।

सामाजिक वातावरण

- जटामसि संकलन कार्यवाट चरन क्षेत्रमा रहेका गोठहरूमा भएको स्रोतहरूको अधिक प्रयोग हुन सक्ने ।
- चरन क्षेत्रमा रहेका सामाजिक साँस्कृतिक सम्पदा जस्तै माणे चिहान आदिमा नकारात्मक प्रभाव पर्न सक्ने ।
- जटामसि संकलन कार्यमा अति साना बाल बालिकाको प्रयोग हुन सक्ने ।
- जटामसि संकलन कार्यमा भीर पाखामा दुर्घटना हुन सक्ने ।
- लेकमा अत्यधिक चिसोको कारण संकलकहरू विरामी हुन सक्ने ।

नकारात्मक प्रभावको न्यूनीकरणका उपायहरू

भौतिक वातावरण

- भिजुएल प्रदूषण कम गर्न जथाभावी फोहर नफाल्न सचेतनाको लागि छोटो अवधिको तालिम दिने ।
- लेकमा पानीको स्रोत दूषित नगर्न पानीको स्रोतबाट निश्चित दुरीमा मात्र खाना पकाउने काम गर्न तथा पानीमा फोहर दिशा पिशाब नफाल्न सचेतनाको तालिम दिने ।
- भू-क्षय कम गर्न माटो कम भन्दा कम मात्र खन्नको लागि सचेतना तालिम दिने ।

जैविक वातावरण

- संकलनको लागि खोलिएका निश्चित ब्लकहरूमा माात्रै कलेक्सनको लागि ज्ञान/तालिम दिने । यी कार्यहरू वन कार्यालय, गाउँपालिका तथा वन उपभोक्ता समूह मार्फत सम्पन्न गर्ने ।
- वन्यजन्तु संरक्षण तथा शिकार नगर्न वन कार्यालय, गाउँपालिका तथा वन उपभोक्ता समूह मार्फत सचेतना तालिम दिने । यस्तो कार्य संकलनको समय पछि पनि हुन सक्ने भएकोले पछि पनि अनुगमन गर्ने गराउने ।
- जडिबुटीका अन्य काम लाग्ने प्रजाति नाश नगर्न वन कार्यालय, गाउँपालिका तथा वन उपभोक्ता समूह मार्फत सचेतना तालिम दिने ।
- वन चरनमा आगो लाग्ने खतराबाट बच्न खाना पकाए पछि अनिवार्य रुपमा आगो निभाउन सचेतना तालिम दिने ।

सामाजिक वातावरण

- पानीको स्रोत नजिक फोहर नगर्न, वन्यजन्तु संरक्षण, स्थानीय सांस्कृतिक वस्तुहरूको संरक्षणको लागि सचेतना तालिम दिने तथा साईटमा पनि मेसेज बोर्डहरू राख्ने तथा राख्न लगाउने ।
- बाल बालिकाको जटामसि संकलनमा प्रयोग नगर्न गाउँ तथा स्कुलहरूमा सचेतना कार्यक्रम संचालन गर्ने ।
- भीर पाखामा दुर्घटना कम गर्न अप्ठयारो ठाँउमा बाटोको निर्माण तथा मर्मत गर्ने ।
- बिरामी हुने तथा दुर्घटनाबाट चोट पटक लाग्न सक्नेलाई कम गर्न समूहहरूलाई प्राथमिक उपचारको बाकस लानको लागि अभिप्रेरित गर्ने ।

आयोजनाको विकल्पहरू

यस संकलन कार्यको खास विकल्पहरू भनेको औजारको विकल्प, संकलन गर्ने समयको विकल्प, संकलन गर्ने स्थानको विकल्प वा संकलन नगर्ने विकल्प हो । यदि जटामसि संकलन गरिएन भने त्यसबाट सरकारलाई प्राप्त हुने राजस्व तथा स्थानीय निकायले कर संकलन गर्न सक्दैन । यसको सबैभन्दा ठूलो मार अन्य रोजगारी नभएका स्थानीय गरिब समूदायलाई बढी पर्दछ, जसले आफ्नो आय आर्जनको ठूलो हिस्सा जटामसि बेच बिखनवाट प्राप्त गर्थे । साथै निश्चित समय पछि लेकमा पनि जटामसि स्रोत नाश हुदै जाने देखिएकोले दीगो तथा चरणबद्ध रुपमा जटामसि संकलन गर्ने विकल्पलाई छनौट गरिएको छ ।

निष्कर्ष

जटामसि संकलनबाट प्राप्त हुने सकारात्मक एक्सटर्नालिटिजको हिसाब गरिएको छैन । तसर्थ यो कामबाट देशलाई जम्मा १ अरब ५६ करोड, १८ लाख जति फाईदा हुने देखिएको छ । यसको साथै स्थानीय रोजगारी र आय जीवनयापनको लागि अति राम्रो सहयोगी फाइदाको रुपमा रहेको छ ।

मेट्रिक्स टेबलको स्कोर तथा आर्थिक लागत लाभ विश्लेषणबाट जटामसि संकलन कार्य गर्दा देशलाई धेरै फाइदा हुने तथा नगर्दा धेरै हानी हुने देखिएकोले यो वातावरणीय प्रभाव अध्ययनबाट हुम्लामा प्रति वर्ष ४२५ मेट्रिक टन जटामसि संकलन उपयुक्त देखी यस परिमाणको संकलनलाई सिफारिस गरिएकोछ ।

Executive Summary in English

Background

The Proponent for conducting Environmental Impact Assessment (EIA) study on Sustainable Harvesting of Jatamasi in Humla is District Forest Office (DFO), Humla. DFO, Humla is located at district headquarter of Humla i.e Simikot. DFO Humla has prepared the EIA report of sustainable harvesting plan of Jatamasi.

Importance of Jatamasi is increasing day to day. According to the data of Department of forest, Nepal government collects around 2.5 crore revenue annually from the collection of 80 different NTFPs. Studies shows that around 160 species of NTFPs can be commercially collected in Nepal. Sustainable harvesting of NTFPs can contribute to both the ecological balance and significant support in the livilyhood of locals. For the development of forest-based enterprises the assessment and study of NTFPs kepts worths. In this context, DFO Humla has proposed the sustainable harvesting of Jatamasi from Humla in a quantity of 425 metric ton annually.

Project description

In last few years Jatamasi is in high demand in the international market, but due to need of IEE and EIA, local traders and communities have stopped harvesting it. Since, the stoppage of harvesting the product, local communities have not received any income from the Jatamasi which is available in high altitude forest and meadows. In this context, DFO Humla initiated the EIA study for harvesting the product. In the study made by DFO Humla Sustainable Harvesting of 425 ton of Jatamasi rhizome is estimated to harvest each year.

Objectives of EIA study

The main objective of EIA study is to assess the baseline environmental conditions of the study area, followed by prediction, identification and evaluation of impacts on the environmental domains; physical, biological, socio-economic and cultural, and identify the appropriate mitigation measures for adverse impacts and augmentation measures for beneficial impacts of the project. Even EIA study helps to prepare Environmental Management Plan (EMP) and also helps decision makers regarding implementation of the project.

Study Methodology

Scoping document (SD) and Terms of Reference (ToR) of the project was approved in 2074/04/26 by Ministry of Population and Environment and thenafter further EIA study was carried out.

The second field visit was conducted for a month starting from Bhadra 1 to Bhadra 31, 2074. The required information related to environmental issues as well as socio-economic issues were studied during the field study. Public hearing was conducted on Bhadra 23, 2074 at Mansarobar Bahumukhi Campus of Simikot after dissemination of information through District Foest Office to its respective Rural Municipalities. Suggestions and recommendations of the stakeholders were collected.

Related informations to the project were collected by various methods which have been described as:

Physical Environment

The information related o the study was collected through secondary sources. These sources include various published as well as unpublished reports of Department of Forest, District Forest Office of Humla, District Co-ordination Committee of Humla. Specially documents of Ministry of Forest and Environment (MOFE), Department of Hydrology and Meteorology (DHM) were reviewed. Information related to soil, water, topography of the study area was collected through the primary and secondary sources.

Biological Environment

The documents from related rural municipalities, DCC, MOFE, and DNPWC were collected. Information related to status of wildlife, NTFPs, and forest were collected through discussion with CFUGs and concerned stakeholders.

Published as well as unpublished documents on project district from related Rural Municipalities, MOFE, DNPWC were reviewed to collect information. Along with it, field survey was done.

Socio-economic and Cultural Environment

Profiles of concerned DCC, District Forest Office etc. were reviewed. During the field study, Focus Group Discussion, Key Informants Interview, concerned stakeholders were consulted and information were gathered.

Policies, Laws, Rules and Manuals

Brief review of relevant national environmental legislations including constitution, policies and plans, acts and regulations, manuals/guidelines, international conventions and treaties, and standards has been carried out and presented hereunder.

Exiting Environment of the Project site

Physical environment

The most of the area of district experiences Temperate and Alpine climate. According to the information gathered from the rainfall station located at Simikot, the annual average rainfall is 784 mm. The area experiences less than -7^0C temperature in the month of Janurary and above 150cm of rainfall in July. The area is warm in June, July and August; whereas there is snowfall in the months, December, January and Feburary. Humidity of air is highest i.e. 86% in the month of July and August whereas lowest in the months, September and October i.e. 60.5%. There is snow in high lands because of which livelihood here is harsh.

Biological environment

There are various kinds of medicinal herbs, NTFPs, and other important plant species. The main economic source of the area is Jatamasi along with other medicinal and NTFPs. The region lacks modern methods of treatment as people have good knowledge on traditional way of treatment using medicinal herbs. Therefore, there is need for good knowledge on use of medicinal plants.

The study area has many fauna as well. Among them 5 species namely Grey wolf, Clouded leopard, Snow leopard, Musk deer, Red panda and 2 species of birds namely Danphe and Cheer has been listed in protected species of Nepal.

Socio-economic and cultural environment

In the project area, total population is 50,858 with 48.63% of female and 51.37% of male live here. 81.62% of hindu and 18.12% of buddhist dwells here whereas other religion followers are in very less number. Average literacy rate is 47% among which 62% of male and 38% of female are literate. There are 140 number of schools; among them there is one Bachelor level of institution. There is one district hospital in the district and 14 health posts.

Main occupation of the area is agriculture. People follow tradition methods of agriculture as there is very less influence of modern agricultural systems. Due to easy availability of grasslands, animal husbandry is another occupation of the area. Major animals species reared in the area are cows, buffalo, sheep, goat, horse, yak, mule etc. Another economic source in the area is animal as means of transportation. Mule and yaks are widely used as means of transportation in the area.

Among the area with very less amount of food in the country, Humla is one where foods are brought through plane fron Surkhet. Therefore, people here mainly depend on collection of NTFPs, essentially Jatamasi. About Rs.25,000 to 30,000 is the annual earning of local by collection of NTFPs.

Humla is surrounded by mountains, rivers hills and forests making it attractive. Simikot has become the main way point to Mansarovar where there are many Indian visitors.

Alternative Analysis

The alternative analysis of the proposed project was considered based on schedule 4 of EPR, 2054. The alternative discussed for the proposed project is mainly concentrated on the project location, site selection, technologies used, implementation procedure and do-nothing scenario.

Potential Environmental Impacts

The implementation of the proposed project is envisaged to have some impacts on physical, biological, and socio-economic and cultural environment. Some beneficial impacts regarding the project are employment opportunities to the locals, support to the local economy, revenue to the government, increase in socio-economic activities, promotion of herbal industry etc. The main potential adverse impact of the proposed project are as follows:

Physical Environment

- Visual pollution in site due to haphazard disposal of plastic bag, sacks, clothes brought and used for different purposes
- Possible change in micro climate due to cutting of trees and shrub by collector
- Impact due to digging and exposure of soil
- Soil erosion in hill top due to haphazard soil exposures
- Dust pollution in collection sites
- Solid waste management in collection sites/ high altitude

Biological Environment

- Degradation of resources due to collection outside the designated block/ sites.
- Disturbance to movement of wildlife
- Possible impact on rare, endemic, endangered, protected and threatened species of flora and fauna
- Illegal poaching, hunting
- Chances of fire in forest or in bush
- Impact on upstream aquatic lives and its habitat of the small streams, where people put tents.

- Intimidation of wildlife
- Loss of local biodiversity

Socio-economic and Cultural Environment

- Possibility of pressure on animal shed in high altitude (i.e. drinking water, toilets including fuel wood)
- Possible damage to cultural heritage and religious sites (i.e. temple, memory places, cemetery) near camping sites due to drinking and dismantling.
- Possible involvements of children in collection activities
- Possibility of accidents and health hazards

Mitigation Measures

The mitigation measures to be implemented during the collection and post collection phases of the project will be as follows:

- Plastic management
- Trainings for sustainable harvesting
- Awareness programmes

Environmental Monitoring

Baseline Monitoring, Impact Monitoring and Compliance Monitoring of the project are included with respective monitoring method, location, frequency and even responsible bodies.

Environmental Impact Audit

The environmental audit of operation of the project will be carried after 2 years of further operation of the project. The total of NRs. 10, 00,000 of amount is estimated for auditing of the project.

Environmental Management Plan

Environmental management plan (EMP) is an important part of the EIA process as it deals with the mechanism including the plan for the implementation of proposed mitigation and enhancement measures, monitoring activities, pubic concern issues and coordination of the work with different stakeholders. The EMP specifies what parties would be responsible for mitigation and how it will be coordinated with non-project participants and schedule.

Project Benefits and Costs

Every developmental activity involves certain costs and benefits associated with the implementation of work. However, such activities also accrue benefits to the local people, society and nation as a whole.

CHAPTER 1-INTRODUCTION

1.1 BACKGROUND

Generally, NTFPs include all goods of biological origin other than timber, fuel wood and fodder from forest, grassland or any land under similar use; which may include medicinal and aromatic plants, bamboo, fruits, tubers, berries, grasses, and so on. NTFPs have become economic incentives for local people to conserve while safeguarding their traditional livelihood strategies as well as cultural values. But sustainable harvesting of such products is challenging.

Out of major NTFPs in Humla, Jatamasi is found in all sites of the altitudinal range 3500m-4500m (12750 ft -14100 ft). The species even grows well at the sites with minimum amount or trace of soil is available. The plant is profound in gentle slopes as well as in steep sites with little soil. This is most widely spread species in pasture lands and forest in the mentioned altitudinal range.

Jatamasi plant is a flowering plant of the Valerianaceae family. It is also known as Indian spikenard (*Nardostachys grandiflora (*D.C.); synonym *Nardostachys Jatamasi (D.C.))* that grows in the Himalayas of Nepal, China, and India. The plant grows up to about 1 meter (3 ft) in height and consist flowers that are rosy, pale, pink in colour and bell-shaped in dense cymes. In the dry form, the rhizome of Jatamasi is brown in colour, covered with numerous hairs like scales and aromatic in smell. Rhizomes (underground stems) of Jatamasi can be crushed and distilled into an intensely aromatic amber-coloured essential oil, which is very thick in consistency.

Associates of Jatamasi

The medicinal herbs found in composition with Jatamasi are like Padamchal, Kutki, Atis etc. These associates are also the medicinal plants which were used in the past by our ancestors as medical sources and are also being used for many medical purposes by present generations.

There is evidence of synergistic growth of Jatamasi with Bhootkeshi (*Selinum vaginatum*) in India but no reports are witnessed such cases in Nepal. It is also a food source for herbaceous animals found at the same altitudinal range.

Uses of Jatamasi

The plant has a rich history being used as medicinal plants and has been valued in Ayurvedic systems of medicine. The rhizomes of the plant as a bitter tonic, stimulant, antispasmodic, and to treat hysteria, convulsions, and epilepsy. The root has been medically used to treat insomnia and blood, circulatory, and mental disorders. Addition to that, it is of economic importance and has been used to produce perfumes and dyes.

Distribution of Jatamasi

This species is endemic to Himalayan Mountain range, occurring in India, Nepal, Bhutan, Myanmar and southwest China between an altitude range of 2,200-4,800 m asl.

Economic importance of Jatamasi in Humla

The main occupation of the local communities of Humla is agriculture and there is no any other activities generating income. Therefore, the collection of Jatamasi provides nominal amount of cash to the locals which plays crucial role to their livelihood. The local people of Humla earns up to 15% of their income from herbs which values up to NRs 10,795 in 2008 (Roy, R. 2010).

Artificial farming is not initiated as it is found in pristine environment.

International scope of Jatamasi

The rhizome is traded at local, regional and national markets. Due to high volume trade and demand, the species is collected from its wild habitat in an indiscriminate way and thus population is declining continuously (Goraya *et al*., 2013).

Nepal has become a potential exporter of Jatamasi essential oils to German along with other six medicinal herbs.

Trade route of Jatamasi in Nepal

The collected Jatamasi is transported through various routes. The possible trade routes for Jatamasi in Nepal are through Hilsa to China, Nepalgunj to India and Limi Naka to Tibet/ China.

Introduction of DFO Humla

District Forest Office works under Department of Forests, which has mandate for protection and sustainable management of forest resources. In Nepal, there are 74 district Forest Offices, except in Mustang. The aims of District Forest Office, Humla are as:

- Protect the forest resources in the district.
- Manage sustainably forest and NTFP products in the district.
- Generate employment for local community from forestry activities.
- Regulate the use of forest resources.
- Promote watershed conservation.
- Support livelihood improvement of local communities
- Conserve forest biodiversity of the district

Table 1: List of Illaka Forest Office and their coverage

S. No	Illaka Forest Office	Rural Muncipality covered
1	Srinagar Ilaka Forest Office	Tanjakot, Adhanchuli
2	Sarkeghat Ilaka Forest Office	Chankheli, Sarkeegad
3	Simikot Ilaka Forest Office	Kharpunath, Simkot
4	Yari Ilaka Forest Office	Namkha

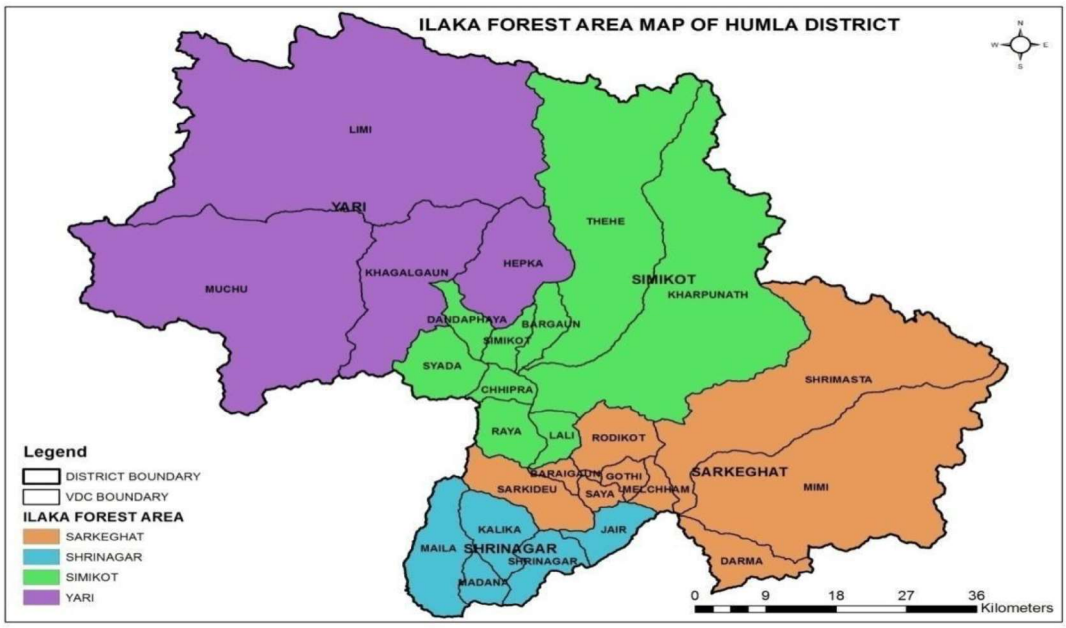

Figure 1: Coverage Map of Illaka Forest Offices

1.2 PROJECT PROPONENT

The Proponent for conducting the "Environmental Impact Assessment (EIA) Study for Sustainable Harvesting of Jatamasi in Humla district" is District Forest Office, Humla, under Department of Forests. The name and address of proponent is as follows:

District Forest Office, Humla

Tel No: 087-680029
Fax No: 087- 680029

Forestry expert Mr. Kumud Shrestha and his team carried out the EIA study of Sustainable Harvesting of Jatamasi in Humla district on behalf of the proponent.

1.3 ORGANIZATION FACILITATION FOR PREPARATION OF EIA REPORT

The project proponent has assigned Popular Environmental Services Pvt. Ltd. to prepare the Environmental Impact Assessment (EIA) report of the proposed Project. Popular Environmental Services Pvt. Ltd. is environmental services provider company established by a team of multidisciplinary environmental professionals in Kathmandu, Nepal with an aim to provide professional expertise in the field of environmental studies, management and monitoring of development projects.

Popular Environmental Services Pvt. Ltd. is familiar with legal requirements and procedures for environmental studies and its approval process as per Environment Protection Act, 2053 (1997) and Environment Protection Rules, 2054 (1997) of Nepal as well as the policies and guidelines required as per the type of the project.

Address of the Consultant

Popular Environmental Services Pvt. Ltd.
Shantinagar, Kathmandu
Phone No.: 01-5260982
Mobile No.: 9849314815
E-mail: keshav.su99@gmail.com

The following expertise has been mobilized to complete this EIA study.

Table 2: List of Experts

Title of Expert	Name of Expert
EIA Coordinator	Mr. Kumud Shrestha
Forest Inventory Specialist	Keshav Ghimire
Botanist	Dr. Illa Shrestha
Environment Specialist	Mukta Dahal
Socio-economist	Keshav Aryal

The declaration from the Proponent (s) and list of the study team members and declaration forms are attached in Annex.

1.4 RATIONAL OF PREPARATION OF EIA STUDY

Government of Nepal has given importance for promotion of NTFP for local life sustenance in remote districts but still ideas are not translated into practice. In this context, Jatamasi is substantial forest resources in Nepal; sustainable harvesting could be the potential support to locals to enhance their livelihood. Unfortunately, due to inadequate support for conducting EIA in herbs, so far no EIA has been conducted for harvesting herbs. In this context, current EIA is first EIA conducted for harvesting herbal resources; therefore, this is a milestone in proving extensive need of environmental assessment and its possibility.

Collection of Jatamasi enhances the livelihood of the locals which finally supports in increasing GDP of the country. Sustainable Harvesting of Jatamasi from forests and pasture lands of Humla has been done in past as well but there was not any EIA studies regarding it.

As per Schedule -1 (Pertinent to Rule 3) under (A) Forestry Sector of EPR (1997, with amendments) the proposed project require EIA study, because the proposed quantity of Sustainable Harvesting of Jatamasi rhizome is more than 50 tons or in present case it is 425 tons. Preparation of Scoping Document and Terms of Reference (ToR) and their approval from the Ministry of Population and Environment (MoPE) for conducting EIA study is a legal obligation. The approved ToR is the basis for conducting the detailed EIA study.

1.5 OBJECTIVES OF THE EIA STUDY

The objective of EIA study is to establish environmental baseline information, identify both beneficial and adverse environmental impacts, analyse their significance, and determine nature, magnitude, extent, and duration of impacts. Then identify mitigation measures,

formulate appropriate enhancement and mitigation measures, propose environmental management and monitoring plan for effective implementation and make easy for decision makers to take decision on the project selection from environmental perspective. More specifically, the objectives of the EIA study are:

- Identify, study and document the existing physical, biological, economic and social and cultural environmental baseline conditions in the project area;
- Recognize, predict and evaluate both the beneficial and adverse impacts in terms of both direct and indirect, including definition of their magnitude, duration and extent in the context of areas affected and durability of impacts that are likely to arise from the implementation of the project;
- Formulate and propose suitable augmentation measures for enhancement of beneficial impacts and, appropriate and practical mitigation measures for adverse impacts incorporating provision of necessary environmental and social safeguards during project operation;
- Prepare an environmental management and action plan ensuring implementation of mitigation measures with proposed responsibilities including monitoring provisions; and
- Complete environmental impact assessment (EIA) study according to EPR, and making acceptable for the internal and external support of the Project implementation.

1.6 STRUCTURE OF THE EIA REPORT

The EIA report contains 12 chapters. Chapter one presents the brief introduction whereas Chapter two explains about the project description. Chapter three contains the study methodology of the EIA and the public consultation process. Similarly, the Chapter four discusses about the existing physical, biological and socio-economic and cultural baseline conditions of the project affected areas. Chapter five consists of the adverse and beneficial impacts associated with the physical, biological and socio-economic and cultural environment. Likewise, Chapter six presents various alternatives to project development and chapter eight presents the proposed mitigation and enhancement measures whereas Chapter eight provides the details of environmental monitoring and Chapter nine describes the Environmental Management Plan (EMP) and Chapter ten presents the policies, laws, rules and manuals relevant to the project. Chapter eleven includes Environmental Impact Audit. Whereas, Chapter 12 summaries the conclusion.

CHAPTER 2-PROJECT DESCRIPTION

2.1 Project Location

The project is located in Humla district, Karnali Province, adjoining to China. The district is in north-west side of the Himalayan range which make the district not easily accessible. Due to presence of part of Himalayas as physical barrier adjoining to Jumla, there is easy access to Humla only from Mugu through the Chankheli Rural Municipality.

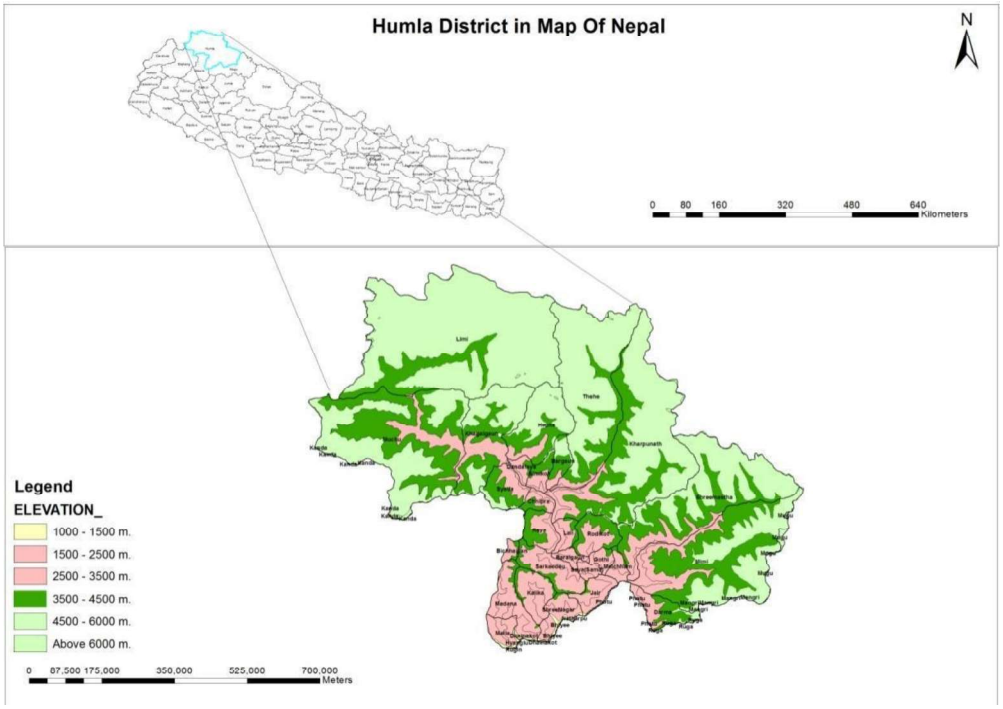

Figure 2: Location of Humla district

In the district, lowest point is at 1219.2 m and highest is 7334.70 m, Simikot, district head quarter that lies at 2944.368 m. Major rivers in the district are Chuwa, Gulfagad, Gothi, Hildum, Kawadi and Hepka and Karnali flows almost from centre of the district. In the district, only 5020 ha is suitable for cultivation. The major crops grown in the district are like Maize, Millet, Jau, Buckwheat, wheat etc.

The minimum winter temperature in the district ranges from -10^0C to -28^0C and summer maximum temperature is from 10^0C to 25^0C. The literacy rate is about 22.62 % (8.87 % female and 36.5 % male are literate). Life expectancy is 53 years.

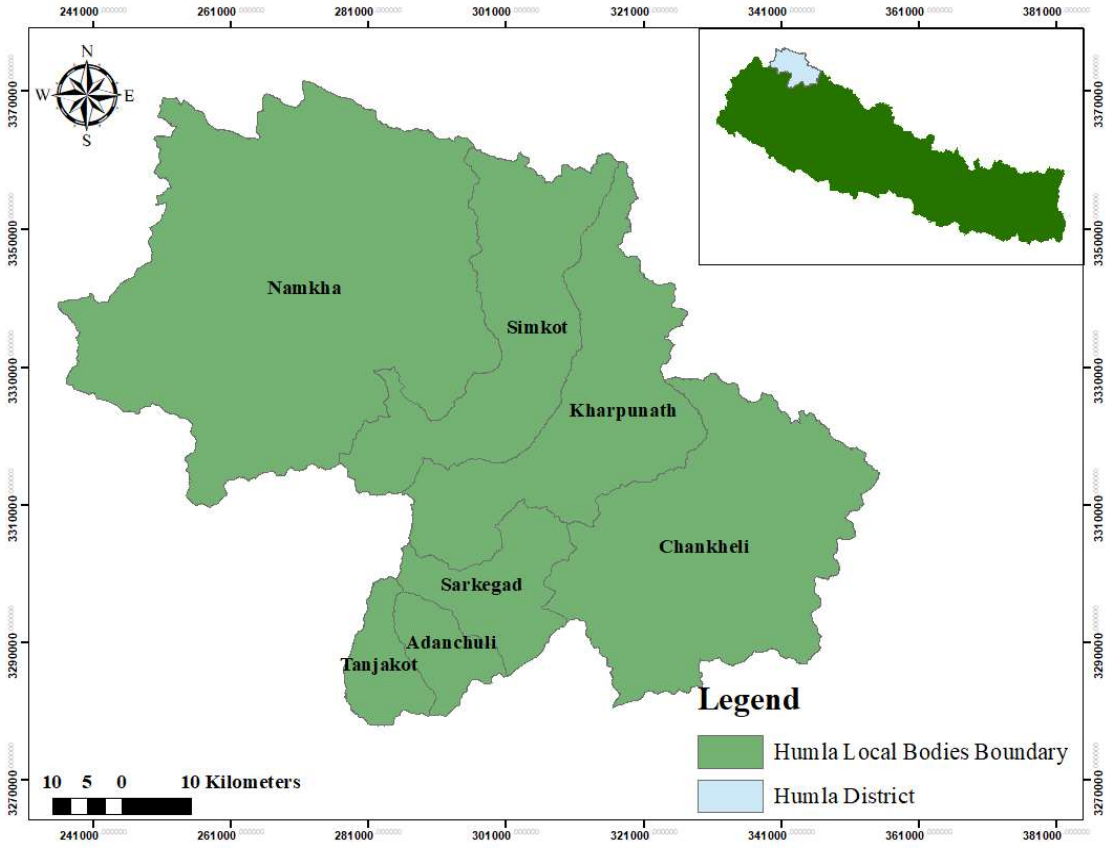

Figure 3: Project Location Map

The district is rich in hydropower resource due to the presence of four major hydro powers; Hildum hp (500kw), Yangar hp (50 kW), Talchhadi hp (50kw), Talki hp (50kw) and Kukurfalna hp (50kw) respectively.

2.2 Project Access

Simikot – the district headquarters - has only one domestic airport at an elevation of 2,945masl, which is the only means of transportation to connect with the nearest cities Surkhet and Nepalgunj. One has to trek either from the road heads of Saanphe Bagar, Achhaam district or from district headquarters of Kaalikot and Dailekh districts for five or more days to reach the southern border of Humla. It takes another four days of trekking to arrive at Simikot.

2.3 Salient Features of the Project

The information about the project and project components are extracted from the Sustainable Harvesting Plan of Jatamasi in Humla district prepared by respective District Forest Office. The salient features of the project are presented in Table 3.

Table 3: Salient features of the Project

Name of the Project	**Sustainable Harvesting of Jatamasi in Humla**
Location	
Province	Karnali
District	Humla
Rural Municipalities	Simkot, Namkha, Kharpunath, Sarkeegad, Chankheli, Adhanchuli, Tanjakot
Area and collection amount	
Appropriate area	154468 Ha
Vegetation covered area	46,338 Ha
Jatamasi covered area	4633 Ha
Rotation period	3 years
Annual Jatamasi collection Area	1544 Ha
Annual harvest quantity	425 tons
Geographical Feature	
Climate	Cool temperate and alpine types
Geology	Rocks of Kuncha Formation of Lesser Himalaya and high grade metamorphic rocks of Higher Himalayan sequences of western Nepal.
Soil	Colluvium, and residual
Terrain	Mountainous
Land use type:	Open pasture and forest land

Source: District Profile of Humal District, 2067BS

Table 4: Rural Municipalities with incorporated VDCs, 2074

S.N.	**Name of Rural Municipality**	**Incorporated VDCs**
1.	**Simkot**	Barghaun, Theho, Dandafaya, Simkot, Syada
2.	**Namkha**	Hepka, Khalgaun, Muchhu, Limi
3.	**Kharpunath**	Lali, Raya, Chippra, Kharpunath
4.	**Sarkeegad**	Jair, Sarkedeu, Gothi, Bairigaun, Rodikot, Saya
5.	**Chankheli**	Darma, Mimi, Shreemasta, Melcham
6.	**Adhanchuli**	Kalika
7.	**Tanjakot**	Madana

2.4 Project Components

EIA of the Sustainable Harvesting Plan of Jatamasi in Humla district is prepared by District Forest Office (DFO) with six years (2 rotation periods) of validity that will be implemented after the approval of the plan. The brief of the report is as below:

The total Jatamasi-occurring area, within this range, in Humla district was found to be 154,460.6 ha. Figure 4 below indicates the Jatamasi-occurring areas in Humla district; the VDC-wise Jatamasi-occurring areas are presented in Table 4.

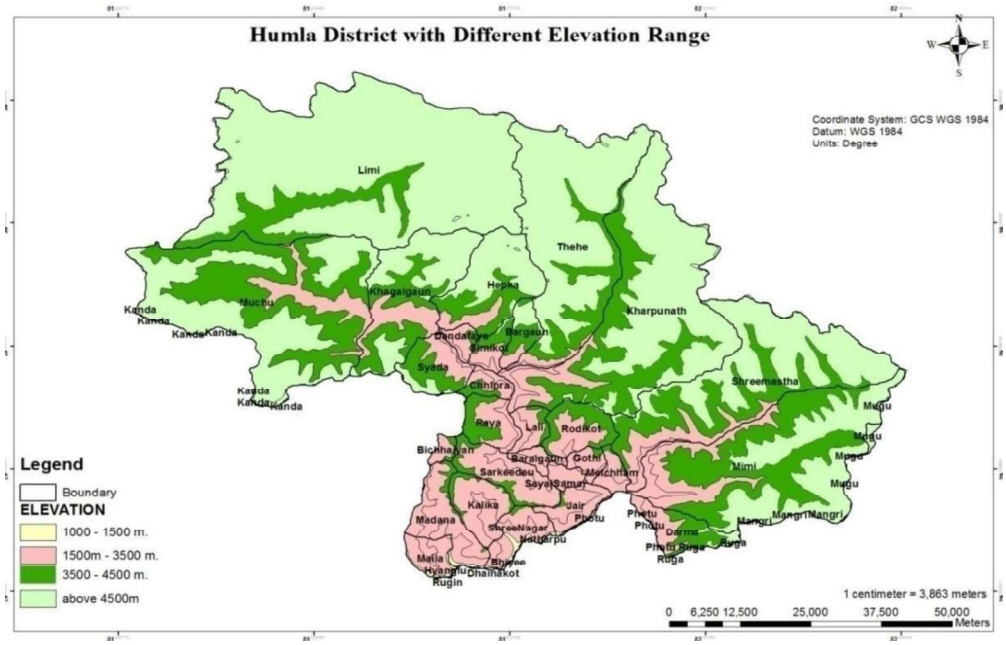

Figure 3: Map showing the Jatamasi-occuring areas in Humla district

Table 5: VDC-wise Jatamasi-occcuring areas in Humla district

S. N.	VDC_NAME	VDC area (ha)	Jatamasi - covered area (ha)	S.N.	VDC_NAME	VDC area (ha)	Jatamasi - Covered area (ha)
1.	Bairigaun	2,168	31.26	14.	Melcham	2,736	68.56
2.	Barghaun	4,431	40.4	15.	Mimi	63,607	26,067.67
3.	Saya	1,633	37.58	16.	Muchhu	74,672	31,499.61
4.	Chippra	3,301	1,003.91	17.	Raya	6,843	2,855.09
5.	Dandafaya	2,303	426.24	18.	Rodikot	8,520	4,151.34
6.	Darma	7,905	3,502.82	19.	Sarkedeeu	10,514	2,077.92
7.	Hepka	19,416	5,648.86	20.	Shreemastha	55,475	17,225.48
8.	Khalgaun	28,525	5,184.66	21.	Simkot	3,686	1,587.08
9.	Jair	5,420	2,125.01	22.	Syada	13,111	4,086.24
10.	Kalika	8,518	1,125.36	23.	Thehe	57,152	9,809.24
11.	Kharpunath	73,618	2,0560.9	24.	Gothi	2,533	227
12.	Limi	119,258	1,3492.6	25.	Lali	3,687	793.92
13.	Madana	10,941	831.8			**Total**	**154,460.6**

A study done by Department of Forests also shows extensive existence of Jatamasi in the high-altitude region especially in Humla district according to the vegetation map (NARMSAP, 2005. Potential Vegetation Maps of Nepal, page 61). The estimated Jatamasi growing area from the study also shows similar results.

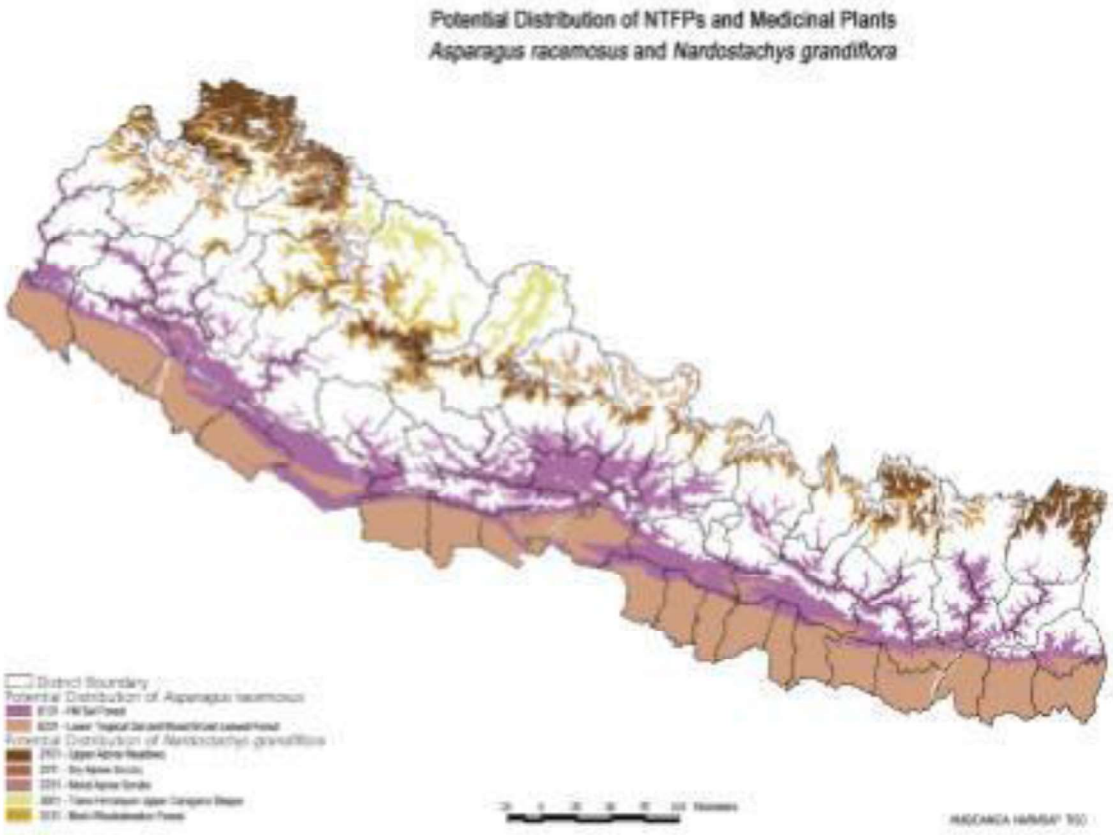

Figure 4: Map showing potential distribution of Jatamasi in Nepal

2.4.1Time of collection

The flowering of Jatamasi begins in the early days of Bhadra, and the flowers produce seed at the end of Bhadra. By the month of Aswin, all seeds are ripened and in appropriate environment these seeds germinate after the winter season. Therefore, Jatamasi rhizome can be collected in the month of Aswin as seeds are ripen, usually after Dasain festival. The rhizome could be collected even in the month of Kartik if there is presence of green plants for visual identification; but after Kartik the plants get dry. Later on, it is difficult to notice due to snow cover. So, the Kartik is the best month for the collection of Jatamasi rhizome.

2.4.2 Drying period

Fresh rhizomes are cleaned within two or three days in the field and air dried and weight is reduced by 47%. But later, there can be further 50% reduction in weight due to further drying.

2.4.3 Rotation period

Jatamasi is supposed to be mature in three years after seeding. But, for sustainable harvesting of Jatamasi, its rotation has been fixed as 3 years, with consideration of conservation of this valuable herb species.

2.4.4 Use of safety factors in estimation of yield

In Humla district, the total area of the altitudinal range suitable for Jatamasi (3,500– 4,500 m) is found to be 154,469 ha. But all this range is not covered by vegetation. In the google map, about 50% of the area is noticed green i.e. covered by vegetation. But to be on safe side, only 30% area is considered to be covered by vegetation. The local communities claim that about 30% of the vegetative area is covered by Jatamasi, which was also noticed in the reconnaissance survey. However, for safety while estimating the products leading to sustainable harvest, only 10% of the area is considered as Jatamasi-occuring area. On this basis, the area covered by vegetation within the altitudinal range of 3,500– 4,500 m is found to be only 46,338 ha. For the conservation of Jatamasi in its natural habitat, about 20% of rhizome will be left unharvested and scattered throughout the harvesting sites. The VDC-wise areas suitable for annual harvest of Jatamasi are shown in Table 6.

Table 6: VDC-wise areas suitable for annual harvest of Jatamasi

S.N.	VDC_NAME	VDC Area (ha)	Area vegetation covered by (ha)	Area with Jatamasi, 30% (ha)	10% area with Jatamasi (ha)	Annual harvestable area, 33.3% (ha)
1.	Bairigaun	2,168	31.26	9.38	0.94	0.31
2.	Barghaun	4,431	40.40	12.12	1.21	0.40
3.	Saya	1,633	37.58	11.27	1.13	0.38
4.	Chippra	3,301	1,003.91	301.17	30.12	10.04
5.	Dandafaya	2,303	426.24	127.87	12.79	4.26
6.	Darma	7,905	3,502.82	1,050.85	105.08	35.03
7.	Hepka	19,416	5,648.86	1,694.66	169.47	56.49
8.	Khalgaun	28,525	5,184.66	1,555.40	155.54	51.85
9.	Jair	5,420	2,125.01	637.50	63.75	21.25
10.	Kalika	8,518	1,125.36	337.61	33.76	11.25
11.	Kharpunath	73,618	20,560.90	6,168.27	616.83	205.61
12.	Limi	119,258	13,492.60	4,047.78	404.78	134.93
13.	Madana	10,941	831.80	249.54	24.95	8.32
14.	Melcham	2,736	68.56	20.57	2.06	0.69
15.	Mimi	63,607	26,067.67	7,820.30	782.03	260.68
16.	Muchhu	74,672	31,499.61	9,449.88	944.99	314.99
17.	Raya	6,843	2,855.09	856.53	85.65	28.55
18.	Rodikot	8,520	4,151.34	1,245.40	124.54	41.48
19.	Sarkedeeu	10,514	2,077.92	623.38	62.34	20.78
20.	Shreemastha	55,475	17,225.48	5,167.64	516.76	172.25
21.	Simkot	3,686	1,587.08	476.12	47.61	15.87
22.	Syada	13,111	4,086.24	1,225.87	122.59	40.85

23.	Thehe	57,152	9,809.24	2,942.77	294.28	98.09
24.	Gothi	2,533	227.00	68.10	6.81	2.27
25.	Lali	3,687	793.92	238.18	23.82	7.94
	Total		**154,460.00**	**46,338.00**	**4,633.80**	**1544.88**

2.4.5 Estimation of reduction or drying factor

In order to estimate dry Jatamasi, 6 plots of 2m x 2m size were sampled from the high-, medium- and low-growth areas. The total fresh weight was 3 kg or 3,000 gm from 24 square meters or 125 gm per square meter. After cleaning the Jatamasi rhizomes from the twigs and soils attached, it was found to be 1590 gm, which was about 47% loss in the weight of the rhizomes; thus, it (47%) was used as the "reduction percentage after cleaning". These Jatamasi rhizomes were further allowed to dry in the store-room. After 3 months of storage, the reduction in weight of the rhizomes was found to be only 795 gm, which was exactly 50% reduction in weight in natural condition. Therefore, while estimating production figures, two reduction figures are used, i.e. 47% cleaning reduction and 50% drying reduction.

2.4.6 Estimation of total collection

The VDCs with the Jatamasi-occuring areas have been classified (by the local communities) into three categories- high, medium and low (productive areas) depending on the Jatamasi production capabilities of the areas as observed in the past and the high, medium and low values as obtained from the field sampling, 150 gm per square meter (A), 106 gm per square meter (B) and 80.4 gm per square meter (C), respectively. After using the cleaning and drying reduction percentages, the productions of Jatamasi on the basis of high, medium and low production values were found to be 393.75 kg/ha, 268.25 kg/ha and 220 kg/ha, respectively (see Table 7).

Table 7: Estimation of reduction factor

S.N.	Quality	Production (raw) grams/ sq.m	Production raw, kg/ha	Production after cleaning kg/ha	Production after drying kg/ha
1.	High	150.0	1,500	787.5	393.75
2.	Medium	106.0	1,060	536.5	268.25
3.	Low	80.4	804	440	220

Thus, for estimating the total quantity of dry Jatamasi (for which permit could be given by the District Forest Office), the quantity of raw Jatamasi needs to be first multiplied with these per hectare figures, and then with the area belonging to the category (A or B or C).

Hence, the total annual production of Jatamasi in Humla district was determined by using the following formula:

$$\sum Pi = \sum XiFi$$

Where *Pi* stands for the total production, *Xi* stands for the quantities from the different Jatamasi-occuring areas and *Fi* stands for the production values (high, medium and low).

Applying this formula, the annual harvest of Jatamasi in Humla district was found to be **4,25, 736** kg i.e. 425 tons (see Table 8 below).

Table 8: VDC-wise annual production of Jatamasi

S.N.	VDC Name	Annual Harvestable area (ha)	Production Quality	Production after cleaning and drying (kg/ha)	Total Production after cleaning and drying (kg)
1.	Bairigaun	0.31	C	220	68.2
2.	Barghaun	0.40	C	220	88
3.	Saya	0.38	C	220	83.6
4.	Chippra	10.04	C	220	2208.8
5.	Dandafaya	4.26	C	220	937.2
6.	Darma	35.03	C	220	7706.6
7.	Hepka	56.49	C	220	12427.8
8.	Khalgaun	51.85	C	220	11407
9.	Jair	21.25	C	220	4675
10.	Kalika	11.25	C	220	2475
11.	Kharpunath	205.61	C	220	45234.2
12.	Limi	134.93	C	220	29684.6
13.	Madana	8.32	C	220	1830.4
14.	Melchham	0.69	C	220	131.8
15.	Mimi	260.68	B	268.25	69927.41
16.	Muchhu	314.99	A	393.75	124027.3
17.	Raya	28.55	C	220	6281
18.	Rodikot	41.48	C	220	9125.6
19.	Sarkedeeu	20.78	A	525.0	8182.125
20.	Shreemastha	172.25	B	268.25	46206.06
21.	Simkot	15.87	C	281.4	3491.4
22.	Syada	40.85	B	268.25	10958.01
23.	Thehe	98.09	B	268.25	26312.64
24.	Gothi	2.27	C	220	499.4
25.	Lali	7.94	C	220	1746.8
	Total	**1544.88**			**425736**

Note: Here only the VDCs which have 3500 to 4500 meter altitude are incorporated in the table.

2.4.7 Conclusion

On the basis of the above estimated calculation, the total weight of Jatamasi after cleaning and drying was found to be **425736** kg or 425 tons that could be harvested. Therefore, the District Forest Office, Humla could get permit up to this amount when high-altitude forest and grass lands are protected and managed for sustainable production of Jatamasi.

However, the weight of fresh Jatamasi immediately after collection in the field will be twice of the weight mentioned here. In other words, in fresh condition, total weight of Jatamasi collected will be 850 tons before drying.

CHAPTER 3-STUDY METHODOLOGY

The ToR for the EIA study of Sustainable Harvesting of Jatamasi approved by MoPE is the guiding document of the EIA study. The EIA process has followed EPR (1997), EPA (1997) and national EIA guidelines (1993). In addition, the EIA is prepared in compliance with other sectorial legislations and guidelines of GoN. Data required for each environmental component i.e. physical, biological and socio-economic and cultural were categorically identified and presented. Similarly, the methodologies of field data collection, impact identification, quantification and prediction and public consultation /involvement were also identified. The following methods were applied to obtain data for the EIA study.

3.1 Desk Study

During the desk study, in addition to the review of environmental statutory legal provisions, EIA manuals and guidelines, the EIA scoping document and approved ToR were reviewed in greater detail to come up with the project study requirement both at desk level and field level. Information relating to the project, particularly, the location of key project features was studied in topological maps to understand the bio-physical environment of the project.

Published and unpublished literatures of the project area pertaining to biological, social, physical and cultural environment in the form of maps and reports were also collected from various sources and reviewed to get information on the coverage of the studies and data gaps that needs to be fulfilled during the field studies to accomplish the EIA requirements

3.1.1 Assembling of Relevant Documents/Information

Relevant documents for the study purpose, such as EPA (1997) and EPR (1997), Inventory and Sustainable Harvesting of Jatamasi in Humla District, District Forest Management Plan were collected. Likewise, legal documents, policy, relevant acts, rules/regulations, manuals/guidelines were collected and reviewed. Relevant secondary information related to concerned forests and forest types were collected from the libraries of relevant institutions like Ministry of Population and Environment (MoPE), Ministry of Forest and Soil Conservation (MoFSC), and Department of Forests (DoF). Socio-economic and cultural information were collected from profiles of project district. The District Profiles of Humla and VDC Profiles of impact VDCs were collected in order to review the information. Data available from the Central Bureau of Statistics were utilized while preparing the report.

Outcomes of a desk review exercise were:

- Prepared a brief strategy of Sustainable Harvesting of Jatamasi.
- Prepared area delineation map of the proposed project sites.
- Prepared public notice and published in the Annapurna Post National Daily News Paper on Phagun 13, 2073.
- Prepared the essential documents for VDC representatives for Public Consultation meetings/workshops at different settlements of VDCs

3.2 Project Impact Area Delineation

In compliance to the approved ToR and scoping Document, impact area was delineated with consideration of such previous impact assessment studies in similar geographical region by similar types of project. The project impact zones were categorized into two; i) Direct Impact Zone (DIZ) and ii) Indirect Impact Zone (IIZ).

Direct Impact Zone (DIZ)

The DIZ is the core area experiencing direct impacts due to the implementation of the project. The concerned ward in which Jatamasi is collected is taken as direct impact zone. This includes Raya, Sarkideu, Thehe, Kharpunath, Rodikot, Shreemastha, Melchham, Darma, Mimi, Kalika, Khagalgau and Hepka.

Indirect Impact Zone (IIZ)

The IIZ indicates a greater area, which will directly or indirectly be influenced by the implementation of the project. In this project, Humla district is taken as indirect impact zone.

Block Division

Jatamasi is supposed to be matured in three years after seeding. For sustainable harvesting of it, its rotation has been fixed as 3 years. Therefore, total area of Jatamasi growing sites has been divided into four blocks in each village council.

Overall Jatamasi growing area can be divided into 3 blocks for three-year rotation on the basis of amount of Jatamasi, accessibility of local people, different physical features and location. On the basis of detail discussion and site visits, major Jatamasi growing sites in different Village Councils are as given below:

Table 9: Name of blocks divided for Jatamasi collection

S.N.	Village Council	Block 1	Block 2	Block 3
1.	Sarkeegad	Reepo, Dhahakhaul	Rodikot	Lek Gus
2.	Changkheli	Nepka	Nidal, Darma and Rimi	Mehkhali Mimi
3.	Namka	Limi Lapcha	Dhadi	Lekjadi Pajadi, Chala
4.	Simkot	Dojam, Kube Bhanjyang	Raling	Seda
5.	Kharpunath	Raya Thali	Lali, Gopka	Kharpunath Durpa
6.	Tajakot	Bhitri Ban	Jhalne Matuse Ban	Gandaino Ban, Dhupi, Dora Ban
7.	Adhanchuli	Manku	Dhida Ban	Naumuli Ban

Block 1:

Limi Area: Mane pane, Jyongwalaya, Jatocheng, Dalchhurongma, Sangtongsa, Chenglungma, Chhiukaringma, Talung, Aardang, Golwayog, Rakhroo, Ningkhola, Takarbo,

Jade, Dembochhiu (मानेपाने, ज्योङवालय, जाटोचेङ,लछुरोङमा,डा साङतोङसा, चेङलुङमा, छिउकारीङमा, तलुङ, आरदाङ, गोल्वायोग, राखरू, निङखोला, टाकार्बो, जादे, देम्बोछिउ)

Muchu Area: Tauban, Sonjom, Hyansi, Tenjoma, Polung, Gangle, Sanejom Khola, Tukwakot, Putle, Syajom, Hirbu, Mongkyabo, Nara, Chala, Chhiudungma, Yalwang, Yanggar, Phupharka, Chyorangwa, Paldakcha, Lamaphu, Tilang thaang (टौवन, सोनजोमा, ह्याङसी, तेनजोमा, पोलुङ, गाङले, सानेजोम खोला, तुक्वकोट, पुटले, स्याजोम, हिरबु,० मोङक्याबो, नारा)

Thehe Area: Ludape, Ringchang, Taunak, Rijul, Tuling, Rikhad, Nilikand, Biphera Khola (लुडपे, रिङचाङ, टाउनाक, रिजुल, तुलिङ, रिखाड, निलिकाँड, बिफेरा० खोला)

Kharpunath Area: Cholarbar, Kirtum, Dhyaba, Majukot, Mutila, Chhukyail, Mainangsang, Gerang, Pirlyadi, Daurikhada (चोलारबार, किर्तुम, ध्याबा, मजुकोट,ला, मुटिछुक्याइल, मैनाङसाङ, गेराङ, पिरल्याडि, दाउरीखाडा)

Block 2:
Limi Area: Tiljiung, Kakuwan, Arula, Chendelung, Chhekuswe, Taklung, Tingri, Rilchiu (तिलजिउङ, ककुवाँ, अरुला, चिन्देलुङ, छेकुस्वे, तकलुङ, तिङरी,० रिलचिउ)

Muchu Area: Takrajong, Chalingkep, Sipsipe, Thadadhunga, Palwang, Khirpani, Oordongma, Ledang, Tuubu, Ludchol, Perang (टाक्रजोङ, चलिङकेप, सिपसिपे, ठाडाढुङ्गा, पालवाङ, खिरपानी,

ओरदोङमा, लेदाङ, तुँबु, लुङचोल,ङ चाला,पेरा छिउङ्डुमा, यालवाङ्ग, याङगार, फुरफारका, च्योरङवा, पालडाकचा, लामाफु, तिलङथाङ)

Thehe Area: Chaupate, Raling, Tumpot, Chhindula, Koran, Bhitakharka, Suntakpa, Chudkila (चौपाटे, रलिङ, तुम्पोत, छिन्दुला, कोरन, भिटाखर्क, सुनटाकपा,० चुडकिला)

Kharpunath Area: Chhumar, Dhanchim, Mandanda, Ludpe, Bosatak, Toparna, Aaukhado, Bhutyachauda, Than Unmudwa (छुमार, धान्चिम, मान्डाँडा, लुडपे, बोसातक, तोर्पिणा, आउखाडो, भुत्याचौड, थान उन्मुड्वा)

Block 3:
Limi Area: Halji, Bhitri Halji, Taan Khola, Jangwan, Pulbung, Siucha, Sake, Maju Dilung, Lalung (हाल्जी, भित्री हाल्जी, ताँ खोला, जाङवन, पुलबुङ, सिउचा,साके, मगु डिलुङ, ललुङ)

Muchu Area: Muchu, Jingden, Gerik, Diling, Ghacha, Chuldingmu, Lading, Puya, Daar (मुचु, जिङडेन, गेरिक, दिलिङ, घाचा, चुलदिङमु, लडिङ, पुया,० डार)

Thehe Area: Gurunggada, Lacharma, Patpari, Yalyang, Tanchim, Senma, Dimchhe, Thadasangu, Raakhadbu, Phayawa, Phuyawas, Yaransang, Churalungw, Midiling, Dilang, Margu (गुरूङगाडा, लाचार्मा, पातपरी, यालयाङ, तानचिम, सेन्म, दिम्छे, ठाडासाँगु, राखड्बु, फयावस, फुयावास, यारनसङ, चुरालुङव, मिदालिङ, दिलङ, मगु

Kharpunath Area: Bamankharka, Syagar, Nikabhala, Tharkot, Kumaryakhaula, Dudhedaha, Kalkharka, Lwarepani, Pirlya, Molya, Mudhila, Dagyadhunga, Ruyari,

Durpabisauna, Salyari, Battibisauna, Ratabhid, Malika Community Forest (बामनखर्क, स्यागर, निकाभला, थार्कोट,

कुमारयाखौला, दुधेदह, कालखर्क, ल्वारेपानी, पिरल्या, मोल्या, मुढिला, डाग्याढुङ्गा, रुयारी, दुर्पाबिसौना, सल्यारी, बत्तिविसौना, राताभिड, मालिका सामुदायिक वन)

3.3 Field Visit

The field visit was carried out from 2074-4-01 to 2074-4-31. The field investigation was carried out by a multi-disciplinary team, which comprised of a Team Leader, Environment Specialist, Forest Expert, Botanist, Ecologist and Socio-economist. Required baseline information on physical, biological, socio-economic and cultural aspects of direct and indirect impact zone was collected during field visit. The information on different environmental components was collected by using following methods.

3.3.1 Physical Environment

Field survey included, besides others, topography, geomorphology, geology, soil, and land stability, and pollution streams to evaluate the baseline conditions. Survey tools such as reconnaissance survey, onsite observation and mapping were administrated using topographic maps, Google images, geological compass, measuring tapes etc.

Other site specific information on the soil, climatic conditions including rainfall, temperature, humidity, winds were verified based on direct observation, and the experiences of the local people. The pollution stream within the project DIZ and IIZ were examined through direct observation and field measurement wherever possible.

3.3.2 Biological Environment

A reconnaissance survey along with interview with the key informants was carried out in the project area for collecting information on the baseline data regarding biological environment. Information on the forest category, vegetation types, species of flora and fauna, current use of vegetation and plants etc. were collected. The presence and distribution of rare/endangered plants and animal species were explored through observation.

Stratified systematic sampling was followed for sampling purposes. Stratification is the process of dividing members of the population into homogeneous subgroups before sampling. In case Jatamasi, a total of 40 representative quadrates of 25*25 were taken because the distribution was
not uniform. If the distribution of the plant was uniform, sample plot of size 4*4 would have been used. Following formulas were used during the study of the sample plot.

1. Frequency =Number of sample plots in which species occurred ÷ Total number of sample plots taken *100

   Relative Frequency (%) =Frequency of individual species ÷ Total frequency of all species * 100

2. Density /ha = Total number of plants of any species ÷ Total number of plots taken x area of sample plot * 100

Relative Density % = Density of individual species ÷ Total density of all species * 100

3. Coverage % = Area occupied by species A ÷ Area of sample plot * 100
   Relative Coverage % = Coverage of species A ÷ Total coverage of all species * 100

4. Importance value index(IVI) = relative frequency + relative density + relative basal area

5. Total yield (gm per ha) = [Density of mature plant xWeight of a mature plant/plant part (in gm.)]

   Total yield (kg per ha) = Total yield (gm. per ha)/1000

   Total Yield from the area (kg) = Total Yield per hectare (Kg) X Total Area (in ha)

To understand the wildlife diversity, habitat and ecology, both direct and indirect methods were used. Transect walks were performed to observe wildlife status in the study area. Group meetings were conducted with local people and during meeting color photographs of different species of birds and animals were shown to document their sighting experience regarding local wild fauna. Taking consideration of the water sources, aquatic life was surveyed.

3.3.3 Socio-Economic Environment

Collection of secondary data, review of pertinent literatures and study of the maps were the methods used for the assessment of socio-economic and cultural environment of the project area prior to the field mobilization. Socio-economic data such as population of the district, households' size, male female ratio, infrastructures, ethnicity, language, religion etc. were derived from central bureau of Statistics (CBS). District profile of the project district was referred for the socio-economic data such as population, infrastructures, food sufficiency, diseases etc. Other relevant information like ethno-botnical information was collected with the use of checklists.

During the field visit, total 45 households of Ripo Village of Sarkeegad was surveyed and information related to their livelihood, socio-economic environment were collected.

3.3.4 Cultural Environment

The cultural environment of the project area, relating to cultural sites, archaeological/historical and religious sites was studied by the use of checklists attached in the annex. The methods used for cultural environmental studies were direct observation of the cultural sites (temples, cremation grounds, festivals sites etc.) and historical/archaeological sites within the project affected areas. Other information related to the cultures was collected by focus group discussion, cultural practices, traditions, significance etc.

3.4 Impact assessment

Matrix method was used to assess impact of the project on physical, biological and socio-economic and cultural environment. Experts' judgement was also used in assessing and evaluating the impacts. The significance of both identified and predicted impacts were evaluated. Based on the evaluation each significant impact was further categorized as high, medium, and low in terms of magnitude: short term, medium term, and long term in terms of

duration and local, site specific and regional in terms of extent. The magnitude, extent and duration were categorized as per the National EIA Guidelines, l 993.

3.5 Public Consultation and Interaction Meetings/Workshops

Public consultation for the proposed project was initiated from the conceptual stage of the project. As required by EPR,(2054),a public notice was published in The Annapurna Post, a daily newspaper , on Falgun 13, 2073, inviting suggestions within the time frame of 15 days. The notice sought opinion and suggestion from the project affected communities and other stakeholders regarding potential environmental impacts of the project on the existing environmental condition of the project area.

The EIA team made extensive consultation with the local affected people and other stakeholders during the EIA study period. Discussion with affected households, checklist administration and group meetings were some of the activities carried out during public consultation.

Notice of Public hearing was disseminated through District Forest Office to its respective Rural Municipalities through official letters referring the issues. Public hearing program as per the provision in the EPR, 2054 was organized on Bhadra 23, 2074 at Mansarobar Bahumukhi Campus of Simikot to discuss the findings of the draft EIA report and to collect suggestions of the local and concerned people of the project area. The total 224 participants were there in the public consultation program.

The summary outcome of the public hearing program is given below:

- The need of maintenance of trail route to the collection site for collecting Jatamasi.
- Need of trainings for local collectors on improved techniques for the collection.
- Regular awareness programs for the locals regarding conservation of wildlife of collection site as well as of the trails.
- Need of strict implementation of block rotation among the collectors.

Collection of recommendation letters of affected communities

The recommendation letter from the affected communities as required by the EPR 2054 was collected and is kept in the annex of the EIA report.

The recommendations given by affected communities collected on Bhadra 22, 2074 are as:

- DFO should inform the concerned Village Council regarding annual Jatamasi collection block in proper manner.
- CFUG should inform the villagers regarding the information collected from DFO about the proper use of Block rotation method.
- In case of the areas beyond Community Forest, Village Council should aware the locals regarding the collection.
- Collectors should be awared about the need of conservation of wildlife and even the punish could be given to collectors.

3.6 Limitations

The limitations of the EIA study of the Sustainable Harvesting of Jatamasi in Humla are as:

- The project includes the large area and Jatamasi are found widely distributed but the study includes limited number of samples.
- Almost all the population dwelling in the district are collectors, but the questionnaire survey was done to the limited number of population.

CHAPTER 4-EXISTING ENVIRONMENTAL CONDITIONS OF THE PROJECT AREA

The study area of the project is whole Humla district. The district area is considered as the Indirect Impact Zone (IIZ) whereas the collection sites are taken as Direct Impact Zone (DIZ). In this chapter, the existing environment of whole district is depicted.

4.1 PHYSICAL ENVIRONMENT

Humla district is located at north-west corner of the Karnali zone. District has the second largest area while it is second smallest by population density. In addition to this, human development index value of the district is 0.432 placing at 74^{th} position in Nepal.

This chapter deals with baseline information of the district focusing to the project area based on the secondary sources available from the district line agencies. In addition, baseline information has also been enriched with primary sources collected during the field visit, field observation, personal interview and group discussion as well.

4.1.1 Topography

The topography of Humla district is characterized with great variation in elevation, slopes and aspects. District extends from 29^0 35 to 30^0 57' North latitude and 81 ^{0} 18' to 82^0 10' East longitude (Humla District Profile, 2015). The lower elevation of district is along the Humla Karnali River which is around 4000 ft. On the contrary, high altitude areas go up to 24064 ft. Jatamasi grown areas also vary in aspect, slope, and pasture land, forest land, and rocky slope. Slope of collection site remains gentle to steep slope but mostly in high gradient.

4.1.2 Climate

The district mainly enjoys temperate, cool temperate and alpine types of climates. The climate of the project area is determined by altitude and seasonal variation. Altitude of the project area lies in between 3500 m to 4500m where Jatamasi grows well. As the temperature in the project area drops below freezing point during the winter, many high passes remain blocked by snow.

4.1.3 Precipitation

Precipitation is the sum total of rainfall as well as snowfall. In general, rainy season starts from late June and ends in the late September. Most of the rainfall occurs during rainy season. The average annual precipitation of the district is 988.23 mm. As per National Adaptation Programme of Action (NAPA) to Climate Change, an overall climate change vulnerability index for Humla district is ranked very low (0.000-0.146) under vulnerability ranking. The average monthly precipitation of the different meteorological stations (1979-2008) in the project area and its vicinity is presented in Table 10.

Table 10: Average Monthly Rainfall (mm)

Month	Average Rainfall (mm)
January	34.58
February	41.12
March	51.05
April	44.30
May	61.42
June	89.68
July	239.95
August	233.89
September	119.99
October	37.60
November	12.63
December	22.02

Source: DHM (1979-2008)

Data in table also shows that higher rate of precipitation is from July (239.95mm) to September (119.99mm). In overall, the average precipitation pattern in the district is lower as compared to the national average (1500mm per annum).

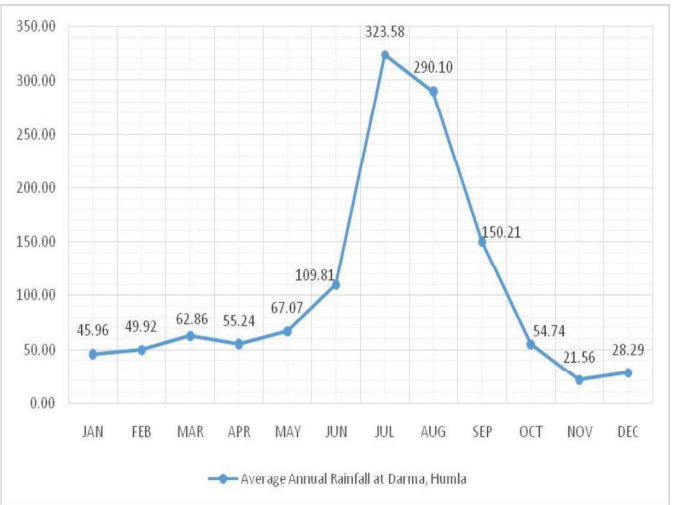

Figure 5: Average monthly rainfall patterns

4.1.4 Snowfall

Within the district, snowfall occurs at specific locations and period. Although specific data/information on snowfall status, intensity and period/days are not available but these are revealed here based on the experience sharing of the local people. In general, snowfall occurrence depends upon on the weather condition of the particular year. Snowfall occurs on almost all locations of the Humla district during winter season. But period/days and intensity vary at Chankheli, Darma, Simkot and other areas. The district receives snowfall mainly in winter season (December to February) in most years. In 2017, heavy snowfall occurred in second week of March.

4.1.5 Temperature

The maximum air temperature is 10^{o} to 25^{o}C during summer and minimum is 10^{o} to -28^{o}C in winter. However, due to variation in altitude, the air temperatures are high in river valleys and low in high mountain peaks. In fact, higher altitude and north facing mountains remain snow covered even in summer season of the year. In the past, Darma (station Index 0313) were operational in the district. But they are now closed. However, according to past records available in Department of Hydrology and Meteorology, the data on temperature and precipitation of two places in Humla (Simkot and Darma) as given below.

Table 11: Average temperature and precipitation at Simikot in different month of a year

Features	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Max Temp	7.5	6.6	11.3	17.2	20.5	22.3	21.9	21	20.1	17.6	13.8	11.3	
Average Min Temp	-7.6	-7.9	-3	3.6	6.8	8.7	10.9	11.3	9.2	3.4	-0.6	-5.7	
Precipitation	23	49	74	42	52	62	158	145	113	36	9	21	784

Source: Sharma, 2014

Table 12: Average temperature and precipitation at Darma in different month of a year

Month	Jan	Fe	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Max Temp	8.9	9.8	12.7	16	19	20.5	20.7	20.8	19.9	17.5	14.8	12	
Average Min Temp	-4.3	-4	-0.9	2.6	5.8	9.5	11.9	11.7	9.5	4.9	0.1	-2.3	
Precipitation	39	47	77	64	72	93	348	314	162	41	15	21	1292

Source: DHM (1979-2006)

4.1.6 Relative humidity

This relative humidity has been taken from Rara meteorological station as Humla does not have the station to record relative humidity. Figure 7 shows that Humla district has the highest relative humidity (86.3%) in August but recorded the lowest (60.5%) in November. An analysis of the meteorological data indicates that in overall distribution patterns of relative humidity in the project area is moderate favouring cultivation of apple, walnuts and apricots including valuable medicinal herbs in the district.

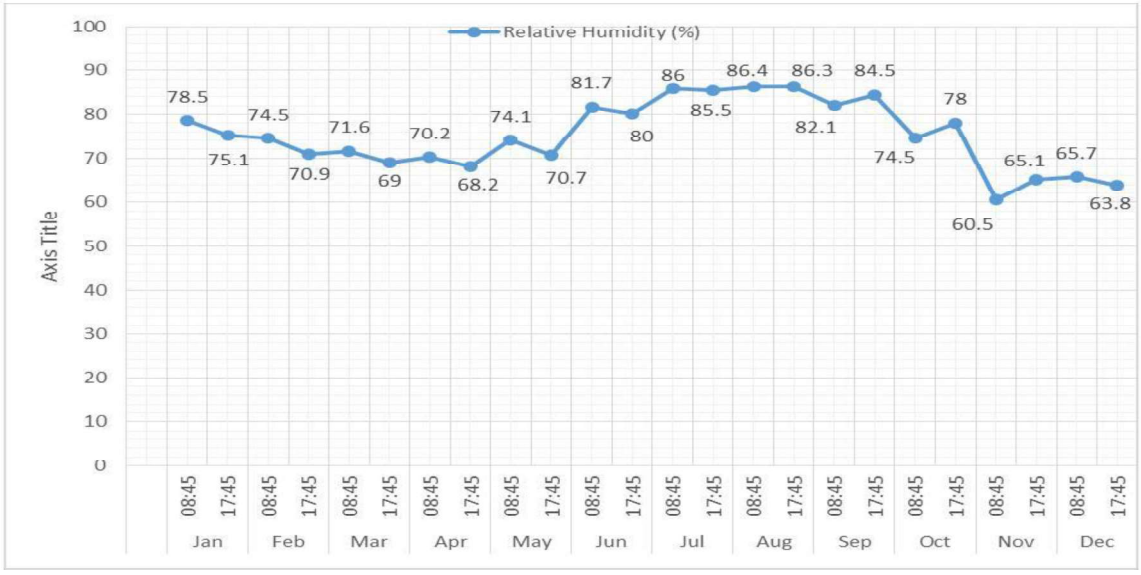

Figure 6: Relative humidity (%) of Rara Station (DHM)

4.1.7 Slope

As Himalayan district, Humla has diversity in terrain and has also the land surface above 40^0 in slope. Land surface above 40^0 in slope covers an area of 1559.01 sq. km. which is 25.96% of total land area of Humla. Detail on slope of the district is given in table below.

Table 13: Slope of the district

S.N.	Slope (Degree)	Area (Sq.km.)	Percentage
1.	0-2	206.54	3.44
2.	2-5	226.53	3.77
3.	5-10	364.16	6.06
4.	10-20	868.27	14.46
5.	20-30	1163.22	19.37
6.	30-40	1616.71	26.93
7.	Above 40	1559.01	25.96
Total		6004.45	100

Source: Humla District Profile, 2072

4.1.8 Land Use

Humla district has 10 different landuse types. Among them, rocky area covers highest area (45.85%), while residential area is only 0.06 percent. Similarly, forest area is 13.22 percent range land is 25.02% over 133 parcels. Jatamasi is found mainly in rangeland area also to some extent in upper temperate forest. The table 13 below shows the detail of landuse types in Humla.

Table 14: Land use types in Humla

S.No.	Land use type	Area in Ha	Percentage
1.	Forests	74783.4	13.22
2.	Cultivable land	5020	0.89
3.	Range land	141449.4	25.02
4.	Barren land	0	0
5.	Residential	352.6	0.06
6.	River/ streams	33500.6	5.92
7.	Gravel river bank	394	0.07
8.	Snow covered area	50570	8.94
9.	Lake/pond/glacial lake	140	0.03
10.	Rocky area	259290	45.85
	Total	565500	100

Source: District Forest Office, Humla from Humla District Profile, 2072

4.1.9 Air, water quality and noise level

Air particles and aerosols are very low in the air as district does not have the activities to add those particles. Similarly, water quality is likely to be very good naturally. District has more than 100 perennial rivers originated from melting the snow. Karnali is the longest river which flows from the middle part of the district. In addition, more than 20 ponds and waterfalls decorate the district naturally. Noise level is minimal except during the movement of animals and humans in the project area. Possibility of contamination on air quality is not possible naturally but occasionally forest fire is recorded in the project area.

Though the secondary information on water quality of these rivers and rivulets are not available, it is observed that the quality of these water resources is found to be clean and clear. There is no any industry and other sources of pollution along the entire river courses. The project area lies in the high-altitude region of Nepal where the potentiality of ground water resources is limited.

4.2 BIOLOGICAL ENVIRONMENT

Humla district has wide variation in elevation, relief and aspects within the project area creates different micro-climatic zones that in turn offer suitable environment for evolving diverse flora and, fauna, and their habitats.

The present discussion mainly focuses on the forests and their types, major tree species, wildlife, and birds' types, availability of protected, rare or endangered species, inclusion of protected area within the project area based on the preliminary field survey for scoping exercise. The following sub-sections present on these aspects.

4.2.1 Forests and Their Types

According to Jackson (1987), forests in the project area are categorized into lower temperate forest (2000-2700 m), upper temperate forest (2700-3100) m and subalpine

forest (3000-4200) m. Within these forest types also, vegetation vary mostly with aspect and humidity.

Due to the altitudinal and climatic variation, there are the following types of forests: Coniferous Forests (48.80 %), Hard wood Forests (4.14%), Mix Forests (41.00 %) and Shrub lands (6.06 %). Many plants have medicinal values, however efforts for conservation and knowledge about their correct use are needed for their sustainability and the economical development of the district (Head Nepal).

These are six forest types based on species compositions, which are (i) Lower temperate coniferous forest: major species blue pine (*Pinus willichiana*) (ii) Lower temperate mixed forest: blue pine, rhododendron (*Rhododendron arboreum*) and oak *(Quercus incana*) (iii) Mixed temperate broadleaved forest: rhododendron and oak (*Quercus semecarpifolia*) (iv) Upper temperate mixed broadleaved forest: rhododendron (chimal: *Rhododendron campanulatum*), maple (*Acer oblungum*) and birch (*Betula utilis*) and other broad leaved species (v) Upper temperate oak forest: Oak (*Quercus semecarpifolia*).(vi) Upper temperate coniferous forest: blue pine and fir (*Abies spectabilis and A. Pindrow:Jhule sallo*) and (vii) Sub alpine forest: blue pine, birch (Bhoj patra: *Betula utilis*) and other scrubby vegetation like Junipers species and Padamchal (*Rheum australe*). (Thakur, RB 2014: A compendium of tree species of Nepal). Similarly, forest in Humla district can be categorized on the basis of climatic zones. The climatic zones and major forest species are as mentioned in table below:

Table 15: Forest types of Humla District

	Forest types	**Details**
1.	Sub-tropical pine forests	Main species chir pine along low part of Karnali river
2.	Lower temperate forests	Different kind of lower temperate forests are as below:
		(i) Pine forests Major tree species is *Pinus wallichina.* This type of forests are found in relatively dry sites.
		(ii) Pine and rhododendron mixed forest, the species are *Pinus wallichiana* and *Rhododendron arboreum*. This is found in sites with relatively more moisture, often western aspects.
		(ii) Oak Forest *Quercus lanata* or *semiicarpifolia* forest *Quercus floribunda* forest *Quercus lamellosa* forest
		(iii) Mixed broad leaf forest This is found in better moisture sites. The species are *Rhododendron arboreum, Cinnamomum tamala, Quercus lamellosa* etc.
3.	Upper temperate forests	Various kind of upper temperate forests are as below:
		(i) *Quercus semecarpifoia* forest
		(ii) Rhododendron forest: The species found are *R. arboreum, R. barbatum, R. campanulatum*. This type of forest are found in more moist area. Often along the stream and or northern aspects.

		(iii) Mixed broad leaf forest: This type of forests area found near to the stream. Main species are maple (*Acer* species), *Litsea*, mixed with other small tree like sibuk thorn *Hippophae salicifolia*
		(iv) Mixed conifer forest: The species found are *Abies pindrow, Picea smithiana, Cedrus deodara*
4.	Sub-alpine forest	Different kind of lower temperate forests are as below:
		(i) *Betula utilis* forest
		(ii) *Abies spectabilis* forest
		(iii) *Juniperus indica* forest
		(iv) Sub alpine forest: blue pine, birch (bhoj patra: *Betula utilis*) and other scrubby vegetation like Junipers species and padam chal (*Rheum australe*). Thakur, 2014

There are five types of forest regimes in the project area. These include:

i. Government Managed Forest:

Except the community managed forest all the forest area in Humla is managed by the District forest office, Humla.

ii. Community Forest:

The project area contains mainly community managed forests. There are 81 community forests which are officially handed over the local community in Humla district. This community forest covers about 30645.82 ha and managed by 6968 households. In the foret user group there are 2.3% women in leading position of the user committee. Similalry, Dalits are 0.78%. Most of the community forests are located in central and southern part of the district which are situated relatively in lower elevation. These are natural forests. According to the present forestry sector policy, the management responsibility for protecting, harvesting and regenerating community forest have been given to Forest User Groups (FUGs). The Community Forest User Groups (CFUGs) can use 75% of the income from community forest for the community development activities and the rest 25% for community forestry development activities.

iii. Leasehold forest:

Leasehold forest is initiated under a plan poverty alleviation program (UPAP) from 2060/61. The project specially supports the household which have the income below the poverty line. So far the program is implementing in 18 VDCs. Among them, there 124 leasehold forest groups who are managing 2422 ha. The total households are 1884 covering 12984 individual beneficiaries. These leasehold forest groups are cultivating medicinal plants as their source of income. An NGO, Deprose, is distributing bee hives, pigs, goats and improve chicken to these leaseholds forest user groups. In addition, NGO is constructing three micro-irrigation schemes for cultivating medicinal plants and other crops (DFO Humla, Annaul Progress Report, 2072, published on 31 Asad 2073).

iv. Private Forest:

Farmers have been planting forest crops in their own land since long. Forest crops were specially fodder species. There are many forest areas are maintained and managed by private

but officially, there are only one registered private forest in the district (DFO Humla, Annaul Progress Report, 2072, published on 31 Asad 2073).

v. Religious forest:

In Humla, there is one religious forest registered in the district forest office which covers 6 ha. This forest lies in Thehe VDC ward no. 1 to 6. The name of this religious forest is Devi Rampaal (DFO Humla, Annaul Progress Report, 2072, published on 31 Asad 2073).

4.2.2 Major tree species in Humla district

The major tree species are recorded from the above mentioned community forests. Most of the tree species available in these forests comprise value of non-timber forest products (NTFPs). Likewise, some of the tree species have social, cultural or religious significance. During preliminary field visit it was observed that forests nearby villages were encroached. For instance, Chankheli and Dasaiyaa Patal CFs were observed encroached clearing trees and bushes. On the other hand, forest far away from villages were more dense and in natural state. The forest support local people completely providing fuel wood, fodder, timber, bedding materials, medicinal herbs and NTFPs. Forest nearby villages are degraded and at remote areas are maintained well.

One banned tree species *Juglans regia* (Okhar) as per GoN category is available within the CFs. Likewise, as per IUCN near threaten and least concern tree species are also reported which are depicted in Table 13.

The existing tree species recorded with their local and scientific names, family and category under GoN, IUCN and CITES are presented in Table 16.

Table 16: Major tree species available in the district

Local name	Botanical Name	Family	GON	IUCN	CITES
Aaru	*Prunus persica ,* (L)	Roasaceae	-	-	-
Angeri	*Lyonia ovalifolia*	Ericaceae	-	-	-
Banjh	*Quercus incana,* Roxb.	Fagaceae	-	-	-
Banjh	*Quercus lanata* Sm.	Fagaceae	-	-	-
Bedo	*Ficus racemosa* L.	Moraceae	-	-	-
Bhojpatra	*Betula utilis,* D.Royle	Betulaceae	-	LC	-
Bhote Pipal	*Populus ciliate* Wall,	Salicaceae	-	-	-
Chimal	*Rhododendron barbatum*	Ericaceae	-	-	-
Dale Chuk	*Hippophae salicifolia-*	Elaeagnaceae	-	-	-
Dhupi	*Juniperus recurve*,	Cupressaceae	-	LC	-

	Buch,-Ham ex D.Don				
Diyar/Debdar	*Cedru deodara,* (Roxb.ex.G.Don)	Pinaceae	-	LC	-
Gurans	*Rhododendron ararboretum,* Sm	Ericaceae	-	-	-
Gobre Sallo	*Tsuga dumosa* (D.Don) Eichler	Pinaceae	-	LC	-
Jhule Sallo/Talis patra	*Picea smithiana,* Wall + Boiss	Pinaceae	-	LC	II
Khasru	*Quercus semecarpifolia,* Sm.	Fagaceae	-	-	-
Lauth Sallo,	*Taxus wallichiana* Zucc.	Taxaceae			II
Okhar	*Juglans regia L.*	Juglandaceae	Banned	-	-
Pande mel	*Pyrus pashia, L.*	Roasaceae	-	-	-
Pangar/Pangre	*Aesculus indica (Colebr.ex.)*	Hippocastanaceae	-	-	-
Rani salla or Pawai salla	*Pinus wallichiana,* A.B. Jacks	Pinaceae	-	-	-
Thingre Sallo, gobre salla	*Abies pindrow, (*Royle) Cambess.) Hook.	Pinaceae	-	LC	-
Talis patra,buge sallo	*Abies spectabilis* (D. Don) Mirb	Pinaceae	-	LC	-
Tilalio	*Ace rcaesium* Wall.ex Brandis	Aceraceae	-	-	-
Utis	*Alnus nepalensis* D.Don	Betulaceae	-	LC	-

Source: Field Survey, June, 2015; GoN Nepal and Neatherlands (1995); CITES 2015; IUCN 2015
EN-Endangered; LC- Least Concern; NT-Near threaten.

Altitudinal distribution of forest species in eastern part of Humla in Chankheli Pass and below is schematically given below. In the schematic diagram vegetation according altitude is shown in eastern and western aspects of the Chankheli mountaion (Pass height 3571 meter).

Figure 7: Intensity of occurrence of major tree species

Some of the major trees species and their intensity of occurrence are given in table 17.

Table 17: Tree species with different occurrence

	High occurrence	Medium occurrence	Low occurrence
1	*Pinus wallichiana* (blue pine)	*Taxus wallichiana*	*Rhododendron campanulatum*
2	*Quercus semecarpifolia* (kharsu)	*Rhododendron lepidotum*	Hazel nut रिगा/कटुस
3	*Pinus ruxberghii* (chir pine)	*Populus ciliate*	*Aesculus indica* पाङगर
4	*Rhododendron arboreum* (Rhododendron)	*Quercus incana* (golde banj)	*Juglance regia ओखर*
5	*Betula utilis* (Birch)	*Cupresus torulosa*	गुयालो or red berry
6	*Quercus lanata* (Banj)	*Alnus nepalensis*	मल्यै also red berry
7	*Acer caesium* (Tilailo)	*Prunus cerasoides*	
8	*Picea smithina* (spruce)	*Pyrus pasia*	
9	*Abies pindrow* (fir)		

4.2.3 Timber and Fuelwood Use

Annual consumption of firewood is 29200 tons in the district. If managed in sustainable way the district has capacity to produce 32225 tons of firewood. Demand of timber is 1 lakh cubic feet per year for construction of house and cattle shed. But, so far the District Forest Office have given permission to construct about 200 house and cattle shed at the rate of 50 cft per households or 10,000 cft (Source: Humla District Forest Office, 2073 Ashadh. Annual Progress Report of Fiscal Year 2072/73).

4.2.4 Medicinal plants and Non Timber Forest Products (NTFPs)

The list of medicinal herbs and NTFPs available in and nearby the project area with their botanical and local name, part use, use value including IUCN status and GoN category are presented in Table 18.

Table 18: Medicinal plants and Non-Timber Forest Products (NTFPs)

Scientific name	Local name	Parts use	Use value/ purpose	IUCN	GoN	CITES
Aconitum heterophyllum Wall ex Royle	Atis	Tuber, Roots	Nervousness, Hear problem			
Swertia chirayita Roxb. Ex Fleming- H Karst	Chiraito	Whole plants	Fever, cold, tonic, intestinal worms			
Taxus wallichiana Zucc	Lautha salla	Bark, leaves	Anti-tumor agent, asthama, bronchitis	EN		
Rheum austral, D.Don	Padamchal	Roots	Laxatives			
Paris polyphylla	Satuwa	Roots and flowers	Gastritis, menstruation pain			
Nardostachys grandiflora, DC	Jatamasi	Rhizome	Perfume, essence, tonic energetic			II
Valeriana jatanasi, Jones	Sugandhawal	Whole plant	Hysteria, epilepsy, cholera, cough, asthama, weakness, hairfall			
Neo-Picrorhiza serophularifolora (Pannel Hong)	Kutki	Whole plant	Fever, cough tonic			
Dactylorhiza hatagirea (D.Don Soo.)	Panchaule	Roots	Energetic		P	
Urtica dioica, L	Sisno	Whole plant	Nephritis, haematuria, jaundice, tooth ache			
Zanthoxylum armatum, DC	Timur	Fruits	Blood pressure, carminative, dyspepsia, tooth ache			
Allium wallichii, Kunth	Banlasun	Bulb	Stimulant, carminative			
Acorus calamusn, L	Bojho	Rhizome	Cough, asthama, tonsil			
Dioscorea glabra	Bantarul	Roots	Vegetable, throat			

			pain			
Juglans regia, L	Okhar	Bark, fruits	Anthelmintic, detergent, scabies		P	
Agraicus sp. and Auricular sp.	Banchyau					

Source: Field Survey June 2015;
LR/LC= Lower Risk/Least Concern; VU= Vulnerable; NT= Near Threatened; DD=Data Deficient; and EN=Endangered, P=Protected.

In addition, two species of plants *Draba poluniana* and *Noccacea nepalensis* are endemic to Dojar Khola, Humla. The above mentioned medicinal herbs and NTFPs are attractive source of cash income in the area.

The table shows Jatamasi as highest quantity permitted for transport out after taking revenue is 59557 kg, which is followed by Kutki and Atis. Quantity of different NTFP permitted to transport out Humla by District Forest Office in different fiscal year is given in table 19.

Table 19: Quantity of medicinal plants permitted in KG

S.No.	Herbs	061/62	062/63	063/64	064/65	065/66	Total
1	Jatamasi	37429	0	22128	0	0	59557
2	Guchchi chayau	328	13497	52	516	0	14393
3	Bhojpatra	0	32402	0	0	0	32402
4	Kutki	4230	2797	11962	36005	0	54994
5	Atis	1617	26881.5	1889	0	0	30387.5
6	Kakadsing	0	0	8	0	0	8
7	Bhutkesh	0	1844	2196	0	0	4040
8	Padamchal	236	0	0	0	0	236
9	Bish	1200	440	0	0	0	1640
10	Ghodmarcha	90	0	0	0	0	90
11	Kaladana	16	318	192	0	0	526
12	Dhupi jara	784	0	0	0	0	784
13	Chiraito	0	0	150	0	0	150

Source: Data from District Forest Office, Humla, BS 2074

In the year 72/73 highest quantity (45400 kg) of Jatamasi was permitted with revenue amount NRs 908000. Quantity collected and revenue from other species in different year is shown in table 20.

Table 20: Quantity and revenue from medicinal plants

Herbs	Year 66/67		Year 67/68		Year 68/69		Year 69/70		Year 70/71		Year 72/73	
	Qt	**Rev**	**Qt**	**Rev**	**Qt**	**Rev**	**Qt**	**Rev**	**Qt**	**Rev**	**Qt**	**Rev**
Jatamasi	35906	7181	24170	2834	28811	5762	23740	4748	21032	4206	45400	9080
Kutki	10000	1500	9228	1384	10618	1593	300	45	2490	373	21650	3247
Atis	7500	1125	2710	406	637	955	450	67	200	30	538	81
Chirato	1000	150	75	11	83	124	0	0	350	53	697	104
Sugandha	5000	750	90	13	0	0	2500	375	400	660	2533	380

wal												
Guchchi chayau	200	600	165	495	0	0	96	288	762	2286	130	390
Bish	2000	200	0	0	0	0	200	20	400	40	0	0
Kaladana	1500	75	900	90	0	0	0	0	230	34	0	0
Kakadsing	492	25	95	14	0	0	0	0	100	5	0	0
Silajit	75	4	0.5	50	0	0	0	0	400	200	0	0
Padamchal	0	0	0	0	0	0	0	0	0	0	7540	75400
Pakhanbed	0	0	0	0	0	0	0	0	0	0	5028	25140
Dhupipat	0	0	0	0	0	0	0	0	0	0	8000	16000
Banlasun	0	0	0	0	0	0	0	0	0	0	120	1200

Note: Quantity (Qt) in kg and revenue (Rev) in hundred rupees. Source: Data from District Forest Office, Humla, BS 2074

4.2.5 Herbal Enterprises

In Humla, there are 360 cottage industries registered. Among them 8 are herbal, which provide season employment for 43 persons. Out of 8 enterprises, one is owned by women and two by indigenous peoples. These enterprises have capacity to produce medicines which worth NRs1,93,13,000. (Source: Humla District Profile, 2072).

4.2.6 NTFP Farming

Altogether there are 153 households who are cultivating NTFPs in their private land. They are cultivating autis, jatamasi and other medicinal plant species. A total of 243 ropani is under NTFP cultivation, in which thirty one ropani of land is under Jatamasi farming. VDCs where Jatamasi farming is done are Darma, Gothi, Lali, Maila, Rodikot, Shreemastha and Syada.

4.2.7 Wildlife

The project area offers an important habitat for a large number of varieties of wildlife. Most of the important mammalians species like Musk deer and Snow leopard stay at grasslands usually on the ridge top whereas less important species like monkey, boar and jackal stay at nearby villages. As per CFUGs including local knowledgeable key informants, the number of less valuable mammal species like *Canis aureus* (Sayal)*, Canis lupus* (Bwanso) are in increasing trend, while the numbers of valuable species such as *Moschus chrysogaster* (Kasturi Mriga), *Ursus thibetanus* (Himali Kalo Bhalu) are in declining trend. It is mainly due to increased practice of illegal poaching of wildlife and declining ground bushes of *Drepanostachyum spp.* (Nigalo) through the attack of diseases, and insects, pests including activities of *Sus scrofa* (wildboar), and *Naemorhedus goral* (Ghoral). Four mammals' species fall under the GoN protected category are reported available at the corridor. As per local people, the list of existing mammals in and nearby the project area and comparative study with category of GoN, IUCN and CITES are presented in Table 21.

Table 21: Major mammals available in Humla District

Local name	English	Scientific name	Family	CITES	IUCN	GoN

	name					
Bandar	Monkey	*Macaca mulata*	Cercopithecidae	-	NT	-
Bandel	Wild boar	*Sus scrofa*	Suidae	-	LC	-
Himali Kalo Bhalu	Himalayan black bear	*Ursus thibetanus*	ursidae	1	VU	-
Bwnso	Grey wolf	*Canis lupus*	Canidae	1	LC	Protected
Dwanse Chituwa	Clouded Leopard	*Neofelis nebulosa*	Felidae	1	VU	Protected
Ghoral	Himalayan Ghoral	*Naemorhedus goral*	Bovidae	1	NT	-
Hiun Chituwa	Snow Leopard	*Uncia uncia*	Felidae	-	EN	Protected
Kasturi Mriga	Himalayan Musk Deer	*Moschus chrysogaster*	Moschidae	1	EN	Protected
Ratuwa	Barking Deer	*Munitiacus vaginalis*	Cearvidae	-	LC	-
Sayal	Jackal	*Canis aureus*	Canidae	1	LC	-
Thar	Himalayan Tahr	*Hemitragus jemlahicus*	Bovidae	-	NT	-
Nawar	Blue sheep	Pseudois nayaur	Bovidae	-	LC	-
Habre	Redpanda	Ailurus fulgens	Ailuridae	1	EN	Protected

Source: Field Survey, June, 2016; CITES 2015; IUCN, 2012 LR/LC= Lower Risk/Least Concern; VU= Vulnerable; NT= Near Threatened; DD=Data Deficient; and EN=Endangere

4.2.8 Birds Species

According to local people, most bird species in and nearby the project area exist with local habitat. As per GoN category, two protected bird species namely, *Lophophorus impeganus* (Danphe), *and Lophura leucomelana* (Kalija*)* are reported in and nearby the project area. The commonly found bird species are compared and verified to the list prepared by IUCN Red Data Book, CITES and List of Endangered, Rare and Threatened Plant Species Published by GoN and presented in Table 22.

Table 22: Major bird species available in and nearby the project area

Local Name	English Name	Scientific Name	Family	CITES	IUCN	GoN
Bhyakur	Babbler	*Stachyris spp.*	Timaliidae	-	LC	-
Bhangera	Sparrow	*Passer domesticus*	Passeridae	-	LC	-
Chil	Black Kit	*Milvus migrans*	Accipitridae	-	LC	-
Chyakhur	Chukar	*Alectoris chukar*	Phasianidae	-	LC	-
Danphe	Himalayan Monal	*Lophophorus*	Phasianidae	1	LC	Protect

Dhukur	Eurasian Collared	*Streptopelia*	Columbidae	-	LC	-
Fogrash	Koklass pheasant	*Pucrasia*	Phasianidae	-	LC	-
Giddaa	Himalayan	*Gyps himalayensis*	Accipitridae	-	NT	-
Garud	Stork	*Ciconia spp.*	Ciconiidae	-	LC	-
Himali Peuri	Tibetan Partridge	*Perdix hodgsoniae*	Phasianidae	-	LC	-
Kag	Jungle Crow	*Corous*	Corvidae	-	LC	-
Cheer	Cheer Pheasant	*Catreus wallichii*	Phasianidae	-	VU	Protect
Koili	Cuckoo	*Cuculus spp.*	Cuculidae			
Lampuch	Long-tailed sibia	*Heterophasia*	Timaliidae	-	LC	-
Latokesha	Grass owl	*Tyto alba*	Tytonidae	-	LC	-
Nyauli	Great Barbet	*Megalaima virens*	Megalaimid	-	LC	-
Titra	Black Francolin	*Francolinus*	Phasianidae	-	LC	-

Source: Field Survey, June, 2016;

LC= Least Concern; VU= Vulnerable; NT= Near Threatened; DD=Data Deficient; and EN=Endangered

4.2.9 Aquatic Biology and Fisheries

The Humla Karnali River and other Kholas such as Chuwa, Gulfagad, Gothi, Hildum, Kawadi and Hepka offer fresh water ecosystems in the district, but these are far from project sites. Local name of fishes found here are Juke, Dhami, etc.

4.2.10 Protected, Rare or Endangered Species

According to IUCN Red Data Book, CITES and list of Endangered, Rare and Threatened wildlife and bird species Published by GoN available in and around the project area are shown in the above tables.

4.2.11 Protected Area

The project area does not contain any national park, wildlife reserve, conservation area, hunting area, including buffer zone area, world heritage sites. However, northern parts of Humla district falls under Kailash Sacred Landscape Area.. This area extends in three countries namely Nepal, China and India.

Biological Hotspots

The hot spots for wild animals and birds in Humla district are as below:

- Ladekhola, larchhama forest, parangdhunga forest and raling mountain of Thehe VDC
- Nyaululek, Chhongsa river area of Bargau VDC
- Takche forest area of Limi VDC
- Naralek, tauwan and sipali forest area of Muchu VDC
- Bokse lek of Syada VDC
- Rimi, chankheli lek and Sarkideu
- Munya lek, kalika and madana of Kalika VDC
- Gusa, Saya, of Jair VDC

4.2.12 Wetlands

There are six major wetlands in the district which are important for aquatic lives, birds, terrestrial animals and humans are given as below:

Table 23: List of wetlands of Humla district

S.N.	Name of Wetland	Place
1.	Dudhe daha	Kharpunath
2.	Jaade daha	Limi
3.	Sekpu daha and hot water spring site	Khagal gau
4.	Lade daha, Raling daha,	Thehe
5.	Digwalu daha	Thehe
6.	Bagne pani daha dil	Lali

4.3 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

4.3.1 Communities

The proposed project area is spread over the entire district especially in northern high altitudes adjoining China. The project area contains 25 VDCs out of 27 VDCs in the district. During the collection of herbs and NTFPs all households from villages go to high altitude forest and pasture lands.

The morphological features of settlements are two forms: scattered and compacted. Settlements at Simkot, Repo, and Darma are concentrated. However, there are also scattered settlements around these concentrated settlements and separately as well. In general, houses in the district are made from wood, stone and mud with traditional wooden flat roof. But, now roofs with galvanized sheet are increasing. In most cases livestock are kept at the same house. Much of the waste water is discharged into open drainage systems and is not safe. Poor drainage facilities have created favourable condition for house flies and other harmful insects.

Chettris, Thakuris and Brahmins are dominant caste/ethnic groups in the district. Likewise, Dalit and Sherpas also reside in the district. In overall, Chettris, Thakuri and Brahmin are

dominant caste groups (74.53%) in the project area. Altogether 23.84% are Dalits, only 0.74% Janajati and other 6.9% people live in the project area. Among Dalits Kami, Damai and Sarki ethnic groups are living in the project area. Nepali is the main language spoken by the people of the project area.

4.3.2 Population

In the project area, total population is 50858 with the average household size of 5.37. Of the total population in the project area, female and male comprise around 48.63 and 51.37 % respectively. The population density of the district is 9 per sq. km. which is much less than the national figure of 180 per sq. km. It is interesting to note that population density during 2001 Census was 7 per sq. km and that has become 9 per sq. km after 10 years. This shows that population density of project district has increased in 2011.

During the household survey conducted in Ripo Village of Sarkeegad Rural Municipality, total 45 households were surveyed. The total population of these households was 240; with 130 males and 110 females.
Demographic data of the field survey has been presented as per ethnic groups below. Three ethnic groups were found dwelling in the village namely, Chhetris, Brahmins and Dalit. Chhetris were dominant in the village followed by Dalit.

Table 24: Ethnic Groups of Ripa Village

Ethnic Groups	Male	Female	Total
Chhetris	101	89	190
Dalit	26	18	44
Brahmiins	3	3	6
Total	130	110	240

Population of active groups was found to be dominant in the village. The detail informations has been presented as:

Table 25: Ethnic Groups as per age groups of Ripo Village

	Age Groups				
Ethnic Groups	0-14	14-25	25-60	60+	Total
Chhetris	61	37	87	5	190
Dalit	17	10	16	1	44
Brahmins	2	1	3	0	6
Total	80	48	106	6	240

4.3.3 Religious Status

There are more than 10 religious followers in Humla district. Almost all of the population fall under Hindu while Buddist remains in second position by population. Detail of religious and population in percentage has been displayed in the table below.

Table 26: Detail on religious status

S.N.	Religion	Population	Percentage
1.	Hindu	41509	81.62
2.	Buddhist	9213	18.12

3.	Islam	11	0.02
4.	Kirat	1	0.00
5.	Christian	100	0.20
6.	Prakriti	1	0.00
7.	Bon	0	0.00
8.	Jain	1	0.00
9.	Bahal	1	0.00
10.	Sikh	0	0.00
11.	Other	21	0.04
	Total	50858	100

All the people of Ripo Village were found to be Hindu celebrating various festivals like Dashain, Tihar, Chaite Dashain, Sankranti etc.

4.3.4 Directly Affected Communities

There are no direct negatively affected households from the project due to its extensiveness and due to its remoteness. Instead, most of the households in the district will be benefitted from the project due to employment.

4.3.5 Literacy and Educational Facilities

The literacy percent is 47, which include male 62 and women 33 percent. The data shows lowest literacy rate in Humla as compared to national average, especially the women literacy rate is lowest.

Each of the district's Illakas has a Resource Centre responsible for supporting and monitoring its share of 144 district schools. There are also seven private schools and one Gumba school. There are also two schools for physically handicaped students along with 116 child learning centres and 38 child friendly centres. There is only one higher secondary providing higher education to bachelor's level. These schools are providing educational facilities in the project area. In addition to government, the international organizations such as Good Neighbours and Plan International are also providing support in promoting educational facilities with the districts. The number of educational institutions in Humla is as below:

Table 27: Number of schools

S.N.	Level	Community	Institutional	Total
1.	Primary/ Basic	87	3	90
2.	Lower Secondary	31	0	31
3.	Secondary	16	1	17
4.	Higher Secondary	5	0	5
5.	Bachelors	1	0	0
	Total	140	4	144

As per the data collected through household survey at Ripo Village, it was found that 121 people were illiterate, 100 were school attendants, and 19 were college attendants. The ethnic groups with educational status of the village has been presented as:

Table 28: Educational Status of Ripo Village

Ethnic Groups	Illiterate	School atttendants	College attendants	Total
Brahmins	4	2	0	6
Chhetris	92	80	18	190
Dalit	25	18	1	44
Total	121	100	19	240

4.3.6 Health and Sanitation

There are facilities of district hospital and public health offices in Simikot- district headquarters of Humla. As per the government policy each VDC within the project area has facility of health post. But these health posts within the project area are not fully equipped with qualified staff and necessary medicines. Although the VDCs in the project area are announced for open defecation free (ODF), the sanitation condition in the project area is poor. It is mainly due to poor structured settlement types where there is no facility of drainage and sewerage at households and villages. Livestock has been kept at the same houses and the system has been supported to multiply houseflies and other animal flies within the settlements. Numbers of major health institutions are given in table below.

Table 29: Major Health Institutions

S. No	Type	Number
1	District Hospital	1
2	Health Post	14
3	Sub health post	12
4	Private hospital	1
5	Delivery center	20
6	DOTS centers	27
7	District Auyurved health centre	1

Various kinds of health problems were seen in Ripo Village among the locals. Number of people infected by various diseases have been listed as:

Table 30: Diseases found in Ripo Village

S.N.	Diseases	Number of patients
1.	Ovarian disease	3
2.	Mental disease	1
3.	Cough	3
4.	Asthma	2
5.	Shivering	1
6.	Stomach	1
7.	Eyesight	1
8.	Heart disease	1
9.	Hernia	1

10.	Cancer	1
11.	Rheumatism	1
12.	Headache	1
13.	*Taenia solium*	1
14.	Fever	1

4.3.7 Occupational Status

The main occupation of the people in the project area comprises agriculture (83%) followed by, services (9%), business (7%) and others (1%). Agriculture practice is still traditional type. Use of modern technology such as improved crop varieties, farming practices, agriculture inputs is nominal. It is mostly due to lack of road transportation. People involve in collection and use of None Timber Forest Products (NTFPs). Mountain goat farming is one of the major sources of income. The other sources of income of the people include local level business, mule transportation, porter involvement in GoN/I/NGOs, and animal husbandry. However, very few percentage of population is involved in business and government and I/NGOs services.

Local people reported that the trend of seasonal migration to India in the project area has been declining after peace process in 2007; however, no official record was found on seasonal migration to India.

4.3.8 Agriculture

Land is the main source for agriculture development. However, availability of cultivated land within the project area is limited. Crop cultivation is mainly depending on monsoon rain except in some cases farmers use local sources of water during monsoon season. The major crops grown in the district are millet, wheat, barley, potato, buckwheat, and beans. The other crops grown include maize, oat, soybeans, grams, *Setaria italica* (*Kaguno/*Foxtail millet), *Raphanus sativus* (*Choti/* Radishi), *Panicum miliaceum (Chino/* Proso millet), upland paddy, naked barley, mustard, and little vegetables. The commonly practised cropping patterns in Humla are: millet- barley/wheat; wheat-buckwheat/potato and wheat-beans. The cropping practices are traditional and dictated by altitude. Modern inputs use is rare. Local people have designed cropping patterns wisely for harvesting two crops in a year. Due to high altitude and low temperature crops maturity period takes longer time.

Livestock is important means of livelihoods in the project area. There is system of animals keeping on open grazing locally known as “Patan”, high altitude areas during summer season. The area is rich in resources for livestock rearing. The commonly domesticated animals include buffalo, cow and bullock, common goat, mountain goat and, horse, yak, mules, and poultry. Buffalo and cow provide milk and milk products and manure for crops. Bullock provides draft power for crop cultivation and common goat provides manure. The agriculture system in the project area is based on farming system and is still in subsistence level. Livestock is an integral part of the agriculture. The crops and livestock are interdependent. The mountain goat, mule, horse, and yak serve as a means of transportation. These are also major source of cash income of the people in the project area.

The district has vast potentiality of temperate fruits and other high value commodities such as apple, walnut, apricot, peach, plum, and pear cultivation, including bee farming. According

to local people, road development will accelerate growth of these commodities including vegetable farming and their seed production, and other high value crops/commodities such as mushrooms, fruit processing, fruit juice and wine, dairy products (e.g. cheese, ghee, chhurpi, wool and dry meat production).

The major crops grown in Ripo Village are like maize, wheat, millet, chilly, spinach, beans, etc. The animals like cow, goats, sheeps and donkey were found being reared in the village.

4.3.9 Contribution of forests in local livelihood

The project area is very remote, so people living there have less urban influence than the people in cities. There local people depend upon forests for herbs as medicine, edible forest products as food and dry herbs as source of income. Animals are used to transport food items from Gamgadhi to villages and in return these animals take dry herbs to market. As the forest area is very big as compared to the populations, in different seasons, local communities go to forests to collect herbs and food items such as ferns, mushrooms, tubers etc. A study from Humla shows that local communities use 47 species from forests. Out of those 22 species are used as wild edible plants, 15 as medicine and 10 for household consumptive purpose like mat. The main tradable and economically valuable items are herbs which include atis (*Delphinium himalayai*), Jatamasi (*Nardostachys Jatamasi*), kutki (*Picrorhiza scrophulariiflor),* guchchi chyaau *(Morchella conica*), etc. Some group collect up to 15% of their income from NTFP, which values up to NRs 10,795 in 2008 (Roy, R, 2010). In addition, forage from forests is main source for their animals.

According to local people, around NRs 25,000-30,000 per household earn in a year by medicinal herbs and NTFPs. Since traditionally local people have developed different systems of benefit sharing of existing herbs and NTFPs among households. But due to unscientific practice of yield harvesting of these valuable herbs and NTFPs yield and production are declining each year. Lack of market facilities, producers have to depend on agents who usually come village to village and purchase bargaining in low price from the owners. Hence, people who have involved in production and other management systems are not earning attractive benefits from these biological resources.

4.3.10 Industries/Traditional Handcrafts

The project area doesn`t have large and medium scale industries. The communities in villages rely on pani-ghattas (water-mills) for grinding cereal grains and make flour. Although the project area has potentiality of hydropower, medicinal herbs, none-timber forest products (NTFPs), wood carving, horticulture, bee farming and livestock-based industries, but none of such industries are developed in large scale. The main constraints for development of industry are lack of easy transportation facility and willingness of investor for promotion of such industries. No potentiality of minerals has been explored in the project area.

The project districts have potentiality of water resource and timber production. Micro and macro hydro power industries can develop from harnessing water resources. Through development of hydropower many other industries whose raw materials are easily available can develop at medium and large scale at the project district. The other important agro-based raw materials as well as high value crops/commodities for cottage industries available in the

project area include apple, walnuts, apricot, plum, vegetable seed production, bee farming, fish farming, goat, sheep and mountain goat wool, and medicinal herbs.

Presently, tourists stopping and Simikot on the way to Kailash is increasing. So, in future eco-tourism can also be substantial industry of the district.

4.3.11 Infrastructures of Development

Transportation Facilities

Presently, Simikot has regular flight from Nepalganj. But, until now, Humla district is not accessible by road transport. Recently, a vehicle has reached from Chinese border to Simikot. It will still take substantial time to reach vehicles from Nepalese road network.

Figure 8: Use of mountain goats

The main means of transportation within Humla are mules, horses, mountain goats and human porters.

Water Supply and Electricity

The preliminary field visit for scoping exercise revealed that almost 10% of the total households in the project area enjoy facility of drinking water using potable water. Rest of the households uses different sources of drinking water such as spring water, river and rivulets. Sources of light are also important component of basic facility. Khar Khola Micro Hydro Power Project with a capacity of 70 KW has been proposed for development by the initiation of local community. The project is located at Bhatte Bada, ward number 5 of Darma VDC, Humla district. Khar Khola Micro Hydro Power Project covers 900 households of Darma, Shree Masta and Mimi VDCs of Humla district.

The main sources of energy is fire wood in the project area. Few hotels and private households use LP Gas. Improved metal and mud cooking stoves are used increasingly nowadays. Government of Nepal and other donor agencies/INGOs are providing such as improved stove, solar and micro hydropower facilities in subsidy.

Communication

People in the project area enjoy communication facilities mainly through mobile telephone. However, the mobile networks (NTC/SKY/HHELLO/NCELL) are not working satisfactorily (Networks are not found/access equally even in same settlement/places). But most of the people have the mobile phones which somewhat makes the communication easier. Communication is easier at Simikot, but uncertain in villages. In addition, there are two FM station, which are Mansarobar FM and Karnali FM. There is also government postal system.

In Ripo Village of Sarkeegad Rural Municipality, there was facility of internet at only one house. Among the total households survey, there was facilities of mobile, television and radio in 33 households and there was no means of communication in the remaining 12 households.

Market Centers

Simikot (District Headquarter of Humla) is main market center in the district. There all types' daily consumption food items are available. As reported by local people and local middlemen work as vendor of medicinal herbs and non-timber forest products (NTFPs) at the project area. Then they take product to sell Gamgadi, Jumla or Nepalgunj for benefits. The main market centers within Humla district is mentioned in table below. Local people believe in development of road and market centers.

Table 31: List of Market Centers

S.N.	Market Centre	Covered Village/ Wards	Beneficiary Households	Goods/ Services
1.	Simikot	Dandafaya, Thehe, Bargaun, Syada, Chhipra, Kharpunath, Simot and Hepka	3259	Daily consumption, construction materials, fancy, non-timber forest products and medicines
2.	Sarkeegad	Saya, Gothi, Rodikot, Sarkedeu and Darma	1621	Daily consumption, construction materials, fancy and non-timber forest products and medicines
3.	Shreenagar	Shreenagar and Kalika	1121	Daily consumption, construction materials, fancy and medicines
4.	Paima	Madana, Kalika, Shreenagar and Jair	1790	Daily consumption, construction materials, fancy and medicines
5.	Kawadi	Maila, Madana, Kalika and Shreenagar	2531	Daily consumption, construction materials, fancy and medicines
6.	Hilsa	Limi, Muchu, Khagalgau, and 14 other villages in northern part of the district	4880	Daily consumption, construction materials, fancy, non-timber forest products and medicines

4.3.12 Tourism and Aesthetic Values

The district has not yet benefitted from substantially from tourism. Unlike Simkot other VDCs do not receive benefits from tourists except from few international tourists trekking to Humla using local trails, other people visiting for official and private business. Although the project area has potentiality of tourism development, due to inaccessibility, remoteness, and lack of basic facilities tourism is not yet developed. One potential tourist destination within the project area is Taklkot or way to Kailash or China. Other important tourist places are Limi Halji Gumba, Yalbang Gumba, Kermi hot spring, Raling Gumba,

Kharpunath temple and Tribeni, Chadangla Himal, Panchamukhi Himal, Dudhe daha, Metha, Limi valley, etc.

Aesthetically the project area is attractive. The natural views of the landscapes of mountains, hills, basins including river systems are amazing. The area is rich in its wilderness seen and scenery. Through the project site higher snow picks can be viewed easily. The view of huge high rocks, deep gorges including green forest sites makes the areas` aesthetic seen incredible.

Data on tourist numbers and seasonality are given in Appendix 6.1. Most of the tourists visiting Humla come from Europe (c.79%) especially Germany (c.27%) and other German-speaking countries. A smaller proportion comes from USA (c.11%). Seasonality of tourism activity is marked. There are peaks between July and October (60% in 1999 and c.50% in 2000) and in May - June (30% and 42% in 1999 and 2000). In Sept – October 2000 there was a cancellation of around 50 groups, probably due to security problems.

Figure 9: Mast (Temple) at Darma, Humla

4.3.13 Culture, Festivals, Religion and Heritage Sites

Almost all people in the project area are Hindu by religion. As in other parts of the country, people of the project area celebrate Hindu festivals like Badha Dashain Tihar and Chaite Dashain, Baisake Purnema, Sahune Purnema, Sawune Sangranti, Maghe Sangranti, Bhumi Dashara, Magh Purnima. Dhami nach and Deuda are famous cultural events/activit1ies among others in the project area. Local people still believe on incarnation of Dhami and Jhankri. The Dhami-Dangri is considered as to Devta (God), and they go to pilgrimage to different Dahas (lakes) such as Dudhedaha, Chayanath, Rinimoksya and Mansarobar on the occasion of Saune Punnima and Vijaya Purnima. They take deep bath in these cold lakes and return home with fresh feeling of being blessed and powerful by God.

The project area does not contain any renowned religious, cultural, archaeological and historical sites

4.3.14 Organizations/Institutions

Many organizations/NGOs are working in the project area. These organizations/institutions are supported by various donors/INGOs and government agencies. The local NGOs are mainly engaged in socio-economic activities, social awareness, health and sanitations, income generations and agricultural sectors. Some of the organizations involved in the project area include Rinmokkshya Samudaik Sanstha, Chhayachhetra Samudaik Sanstha, Dalit Utthan, Pragatishil Mahila Samuha, Chnadrodaya Samudaik Mahila Samuha, Fulbari Mahila Samuha, Chandra surya Samudaik Sanstha, Pragatishil Dalit Samudaik Sanstha, Malika Samudaik Sanstha, Karnali Bikash Samudaik Sanstha.

4.3.15 Trade Route of Jatamasi

The collected Jatamasi is transported through various routes. The present route of trading of Jatamasi in our country is presented as below:

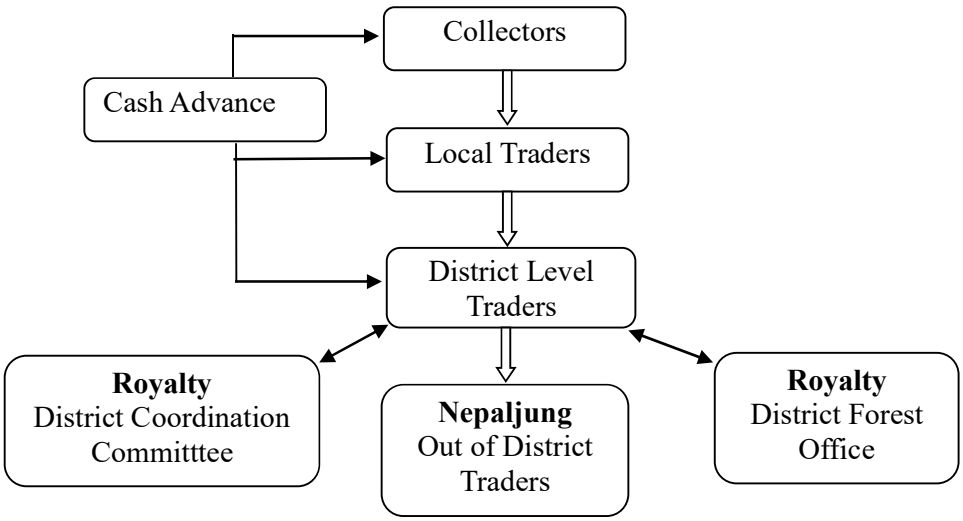

Figure 10: Trade route of Jatamasi in Nepal

The possible trade routes for Jatamasi in Nepal are as:

- Hilsa (route to Tibet/China)
- Nepalgunj (route to India)
- Limi Naka (route to Tibet/China)

CHAPTER 5-POTENTIAL ENVIRONMENTAL IMPACTS

5.1 BENEFICIAL IMPACTS

5.1.1 Collection phase

5.1.1.1 Opportunity of employment and income generation

Since the Jatamasi is found in remote areas of the project area, the local people will be hired on behalf of local traders for the collection purpose. This is the only activity that local can debt the money forehand for their household uses from traders. As the women in this area are found to be involved in household activities rather than in income generating activities because of which they are facing economic crisis frequently in need.
About 56% of the total population of the district falls under poverty line. Therefore, this project will enhance the women in income generation activities through employment during collection of Jatamasi. Not only women, men will also get employment opportunities. However, women employment will be given high priority as well as privileged groups will also be given more employment opportunities.

The activities generating employment opportunities for local people are as:

- Uprooting of Jatamasi
- Gathering of Jatamasi
- Cleaning the roots at field site
- Transportation to houses (porters, animals like sheep, mules, goats, etc)
- Helpers
- Cleaning at house
- Drying
- Storage
- Transportation to the district headquarter

In all these activities, they will get employment and enhance their economic standards.

5.1.1.2 Support to local industry

During the collection of the herb, there is up and down activities of local people throughout the district. People from various parts of the district will flow to the collection sites of the district. These collectors as well as traders will rent and dine in hotels on the way to collection sites. Thus, the project will enhance the teashops, hotels of the project sites.

With the amount earned from the collection of Jatamasi, locals can start grocery shops, teashops, souvenir shops for tourists and even shops of local handmade raiment for local as well as foreign tourists to the area.
Local people with the help of money from collection activities will be able to earn herd of animals and enhance animal husbandry as employment for rest of the months other than collection times.
As the Jatamasi is used to extract oil from it, the oil plant could be fascinating industry to the area. If there is establishment of the oil processing plant in the area, further job employment will be generated. The government will also be able to collect revenue from such industries which can be used in development activities of the area.

5.1.1.3 Cash in hands of women

Generally, the women in these areas are the one who manages economic activities of the family. So, they are in need of money for family activities. The project will provide employment to women during its collection, transportation and this will help women to get cash in hands for household activities.

5.1.1.4 Enhancement of skills and capacity of Jatamasi/ NTFP collection

Since, the project will give trainings on sustainable harvesting of Jatamasi to locals before collection. This will empower the knowledge of locals as well as the skills of locals in the field of NTFPs and their importance to ecology. Along with the knowledge of NTFPs, the locals will be able to get ideas on processing methodologies of the NTFPs in appropriate ways. Communication skills of local will be enhanced through the harvesting project. Exchange of skills among the employee from various parts of the country will enhance the skills of locals.

5.1.1.5 Revenue to government

The project will give revenue of NRs. 20 per kg of Jatamasi to District Forest Office by the traders. Out of the revenue, 10 percentage of the collected revenue in DFO will be used in district via District Coordination Committee. At present, District Coordination Committee has stopped to raise revenue so concerned Rural Municipality will raise Rs. 15 per kg of Jatamasi from the traders. This revenue could be used in development of infrastructures in the area as there is lack of many infrastructures of development.

Even the government could collect revenue during its transportation to the international markets and that revenue could be used in national developmental activities. Also, the government could collect revenue from the oil processing plants if established in the project site or district.

Concerned authorities will be aware about illegal transacts of Jatamasi which will help to conserve the herb. Concerned authorities will use the revenue in awareness generation about sustainable harvesting which will eliminate illegal transactions.

5.1.1.6 Maintenance of walking trails

One of the sources of income in high altitudinal livelihood is animal husbandry. During summers, these herds of animals are taken to high rangeland for grazing through harsh and physically damaged trails which could be death trail to many of animals and sometimes to herders as well. Therefore, the collection activities need these trails, the trails will be renovated or widen by the collectors with support of traders. These widen trails or renovated trails will enhance easy access to local herders as well as collectors.

5.1.1.7 Minimization of unsustainable harvesting

Since, the harvesting of Jatamasi has been prime economic source for the locals of the project site, locals will be aware about sustainable harvesting of it. They will inform other and motive others for sustainable harvesting. Locals will inform the concerned authorities if any kind of illegal activities related to harvesting is witnessed.

Past harvesting practices

In past, Jatamasi was collected in the sites which were near to the villages and far sites remained untouched. In addition, collection was done even during Shrawan and Bhadra, when flowers are still blooming, or seeds are not ripen. These collection practices are unsustainable and could lead to degradation of the resources.

Proposed Sustainable harvesting methodology

In proposed methodology, rotation is recommended for three years. This means the crops will be harvested at the age of 3 years. For this purpose, all area where Jatamasi occur are divided into three blocks. In addition, harvesting is recommended only after seeding. This means there is adequate chance that the crop will regenerate from seeds. In addition, in each harvesting sites, about 20% of the rhizome are left as insurance for regeneration if the seeds fail to germinate due to adverse climatic conditions like drought. Therefore, harvesting is planned to be sustainable.

Further, safety margins are allowed in estimation of potential sites as 3500 m to 4500 m in stead of conventional altitude range 3200 meter to 4500 m. Likewise, in the altitude range, there is 50 percent vegetation is estimated from google images, but for safety only 30 percent vegetation is considered. In the green sites also jatamasi is thought to be in 30 percent, but only 10 percent area is considered as jatamasi growing area. Due to lack of exact data such safety factors are used to avoid depletions of resouces. But, if the data improves in futures, such safety margins could be reduced. All these proposed methodologies make sure that the resource base is sustainable.

5.1.2 Post collection phase

5.1.2.1 Contribution to life sustenance

Local communities, especially poor people in villages of Humla do not have enough money to send children to school and to buy clothes and essential food items like oil, sugar, rice etc. The money gathered from collection of Jatamasi will enhance the life sustenance of the poor households. Otherwise, these household have to take loan or sacrifice their essential goods and services.

5.1.2.2 Contribution to herbal industry

The money earned from the traders or business persons will be spent on establishing herbs related micro distillation plants. Some traders have also allocated their private land for farming medicinal plants. Such farming will help in conservation of the herbs for future generation and will encourage others to such herbal industry.

5.1.2.3 Empowerment of local women

As many male populations have migrated to foreign lands in search of employment, there are mainly females left in the villages holding their families with agriculture. Therefore, the collection and selling to traders will be promising source of income generation to support the husband and family and fulfil the essential demands of the family members.

Table 32: Matrix for Beneficial Environmental Impacts

Aspect	Impacts	Nature	Magnitude	Extent	Duration	Total
Collection Phase	Opportunity of employment and income generation	Direct	60	20	20	100
	Support to local industry	Direct	20	60	20	100
	Cash in hands of women	Direct	20	20	5	45
	Enhancement of skills and capacity of Jatamasi/ NTFP collection	Direct	20	20	20	60
	Revenue to government	Indirect	20	60	20	100
	Maintenance of walking trails	Direct	20	10	20	50
	Minimization of unsustainable harvesting	Indirect	20	20	20	60
Post-collection phase	Contribution to life sustenance	Indirect	10	20	20	50
	Contribution to herbal industry	Direct	20	60	20	100
	Empowerment of local women	Direct	20	20	5	45

Magnitude: This can be low-L (minor), medium-M (moderate), and high-H (major) depending on the scale or severity of change.

Geographical extent: If the action is confined to the project area, it is referred as sitespecific (Ss), if it occurs outside area but close to project area, the extent of impact is local (Lc), if it occurs far away from the project, it is referred as regional (R).

Duration: It can be short term (St-i.e. less than 3 years), medium term (Mt-i.e. 3-20 years), and long term (Lt-i.e. more than 20 years).

S.N.	Nature	Magnitude	Extent	Duration	Total
1.	**Direct**	Low (10)	Site Specific (10)	Short term (5)	General (25-50)
2.	**Indirect**	Moderate (20)	Local (20)	Medium term (10)	Moderate (51-75)
		High (60)	Regional (60)	Long term (20)	High (>75)

5.2 ADVERSE IMPACTS

5.2.1 Impact on Physical Environment

5.2.1.1 Collection Phase

5.2.1.1.1 Visual pollution in site

Group of local villagers will go to high altitude where Jatamasi is found with the food items, warm clothes, cooking pots, bedding material, plastic tents, ropes and plastic bags for collection and spade for shallow digging during collection of Jatamasi. During the collection days as well as after the collection, they will dispose those plastic bags, wrappers of chow-chow, tobacco products, rag clothes, plastic water bottles, beer bottles, alcohol bottles, sacs etc. haphazardly in the site creating visual pollution or destroying scenic beauty of the sites.

5.2.1.1.2 Possible change in micro climate

Collectors will use water from nearby springs for drinking purposes as well as for washing, cooking and others. Collectors will also use of firewood wood for cooking and heating from nearby forests and there will be exposure of soil while digging the rhizome. There is no felling of trees in the collection activities. But the activities like use of firewood from nearby forest for long period of time may result into change in micro climate of the collection site.

5.2.1.1.3 Reduction and pollution of water

The collectors will use water from the small streams present in the collection sites for cooking and washing purposes. These streams are water source for wildlife dwelling in the forests near to collection sites. These activities of collectors may pollute water sources by washing their utensils and clothes. Disposal of plastic bags, rags will also pollute the water sources though there will not be reduction in amount in water.

5.2.1.1.4 Soil erosion in hill top due to haphazard soil exposures

The rhizome of Jatamasi will be uprooted by hands by collectors as rhizomes are not deep rooted. In some cases, small spade will be used for assistance for collectors for shallow digging. Since shallow digging will be made, there will be less chances of soil erosion. In case of heavy rainfall after digging may result in soil erosion in the sites.

5.2.1.1.5 Dust pollution in collection sites

As the digging will be shallow, the digging will not create dust pollution in the collection sites.

5.2.2 Impact on Biological Environment

5.2.2.1 Collection Phase

5.2.2.1.1 Depletion of Jatamasi

If resources are collected from nearby sites, it reduces their burden of transportation. Therefore, local communities will be collecting Jatamasi in the sites wherever they like in unsystematic way or haphazardly. But, with introduction of 3 years rotation, the collection will be stopped in

3 blocks out of 4. So, they need to confine their collection every year in only one block as designated by the sustainable harvesting plan. If local communities fail to follow the collection in confined permitted blocks, depletion of Jatamasi will occur.

During harvesting of matured rhizomes, other juvenile Jatamasi may be uprooted and thrown carelessly. Careless harvest of rhizome of Jatamasi may sometimes result into uprooting of unmatured plants of Jatamasi. Such activities will lead into checked dispersion of seeds to the area for future germination.

5.2.2.1.2 Disturbance to movement of wildlife and poaching

The animals like Danphe, Naur, Jharal etc. dwells high altitude where Jatamasi are found. During the activities of collection, large number of local people gather in such area which will disturb the movements of animals as well those animals will be scared.

In addition, people may prefer to live in dens or caves in order to protect oneself from cold ad these dens or caves are house for many animals. These activities will hinder the wildlife habitat and movements.

As poaching needs gun shoots, it will be difficult to kill animals in presence of large number of people. Though they may gather and hunt the wildlife for their living during the collection time.

5.2.2.1.3 Damage to associated plants

While collecting Jatamasi, local communities may affect germination, damage small Jatamasi plants and other associated species by trampling and breaking the plants.

5.2.2.1.4 Possible impact on important wildlife

The possible impact on wildlife during collection of Jatamasi could be hunting of wildlife found in the same altitudinal range of Jatamasi. But due to noise caused by the group of collectors, there will be less chances of finding animals nearby collection sites during collection period. In addition, Jatamasi plants and rhizomes are not useful as food, shelter and cover. So, the damage to Jatamasi is not significant.

5.2.2.1.5 Illegal poaching, hunting and intimidation of wildlife

Collectors may get more information about animal species and their habitats. They may know the route network of wildlife movement and their strategic common point. Based on this information, some local people could support to poacher by putting nets in strategic animal's movement points. But, such impacts will be less significant as poachers will be afraid to handle the chaos of such groups of collectors.

5.2.2.1.6 Chances of forest or bush fire

Collectors will use fire for cooking and heating purposes in collection sites during the collection period. They may ignore fire and leave it without lilting off after cooking or heating. In this situation, wind may help fire to catch nearby litters or bushes that could result on forest or bush fire in the Jatamasi collection rangeland or nearby forests. In addition, some of the

collectors may smoke and they may throw the last piece of tobacco stick without lilting off, which also may result on firing.

5.2.2.1.7 Impact on upstream aquatic lives and their habitats of the small streams

Collectors need water sources for cooking, feeding, washing clothes, taking bath, cleaning cooking pots etc. So, they may put their tents nearby the water sources. This causes throwing disposable materials in the water sources. These activities could pollute the small streams of the collection site. Similarly, disposable material may also cause the effects like poison for the aquatic lives. Collectors may try to collect aquatic lives like fish for their food, but this is impossible due to absence of water bodies in the upstream site where jatamasi is used to collect.

5.2.2.1.8 Loss of local biodiversity

Human activities could disturb the movement of local wildlife while collectors move to and fro in search of Jatamasi. In addition, over use of plants products like firewood may deplete those firewood species from the collection site. The excess use of firewood may result on lowering plant density and plant abundance. But it is not likely to lose the local biological diversity because of the activities of collectors while collecting Jatamasi.

The collectors may uproot the other associates of Jatamasi in process of harvesting Jatamasi. Collectors may give less concern to associates of Jatamsi and this haphazard uprooting of those associates may result into loss of those species after disturbances for long period of time.

5.2.2.2 Post Collection phase

5.2.2.2.1 Possibility of increase in poaching and hunting

Collectors will be known to almost all the parts of forest and range land while collecting Jatamasi. So, they will be well informed about the habitat of wildlife species, movement routes, route network of wild animals, key location, strategic common points etc. in the collection sites. Due to the availability of information about the wildlife habit and habitats, collectors may put net for catching animals. In addition, they may kill wildlife strategically in the key points.

5.2.3 Impact on Socio-economic and Cultural Environment Collection phase

5.2.3.1 Possibility of pressure on animal shed near to high altitude

As the one of the local occupations, animal husbandry is second dominant occupation after agriculture for their livelihood. Animal herd are taken to high hills for grazing where Jatamasi is also found. Therefore, Jatamasi collectors will invade on water sources as well as firewood of those herders during collection time. Herders will have to compete with collectors for water and firewood. Large group of collectors may also pollute the nearby water sources by defecation, urination and other activities. Through these activities, collectors will be creating pressure on animal shed. In addition, shed owners may feel social disturbances.

5.2.3.2 Possible damage to cultural heritage and religious sites

Project area is rich in temples, memory place, and cemetery. Protection and promotion of those structures are also the social responsibility of collectors. However, collectors may ignore and unintentionally dismantle the structures while collecting Jatamasi. In addition, some of the collectors may have an eagerness of new things and touch the structures haphazardly. Similarly, they may write on those structures and thus denigrate the religious value of those monuments or structures. Since, the collectors are local of Humla, there is less chance of such illogical activities in religious sites and structures.

5.2.3.3 Possible involvements of children in collection activities

Economically poor parents may take their children with them in seek of helping hands for collection activities. As almost all children go to school and almost all parents are aware about need of education, there is less chance of child labour in the collection activities.

5.2.3.4 Possibility of accidents

As the sites have harsh topography with steep slope, narrow path, rocky and often slippery, in addition, collectors will be carrying large volume of the product making them unbalanced; this increases chances of leg hitting and getting wounds. They also could move very fast resulting accidents.
As the collection sites lie in high altitude, collectors may suffer from high altitude sickness and lack of immediate rescue may result into death of such victims.

5.2.3.5 Possible natural health hazards

In collection sites, due to low temperature collectors may get problems of cold and cough. Similarly, collectors may have problems of respiratory tract infection and etching eyes while drying and cleaning at households.

Table 33: Matrix for Adverse Environmental Impacts

Aspect	Phase	Impacts	Nature	Magnitude	Extent	Duration	Total
Physical Environment	**Collection Phase**	Visual pollution in site	Direct	20	10	5	35
		Possible change in micro climate	Indirect	10	20	20	50
		Reduction and pollution of water	Direct	10	10	10	30
		Soil erosion in hill top due to haphazard exposures	Direct	10	20	20	50
		Dust	Indirect	10	10	5	25

		pollution in collection sites					
Biological Environment	**Collection Phase**	Depletion of Jatamasi	Direct	20	10	20	50
		Disturbance to movement of wildlife and poaching	Indirect	20	20	10	50
		Damage to associated plants	Direct	20	20	10	50
		Possible impact on important wildlife	Indirect	20	20	20	60
		Illegal poaching, hunting and intimidation of wildlife	Indirect	20	20	20	60
		Chances of forest or bush fire	Indirect	20	10	5	35
		Impact on upstream aquatic lives and their habitats of the small streams	Indirect	20	20	10	50
		Loss of local biodiversity	Indirect	20	10	20	50
	Post-Collection Phase	Possibility of increase in poaching and hunting	Direct	20	20	20	60
Socio-economic Environment	**Collection Phase**	Possibility of pressure on anima shed near to high altitude	Direct	20	10	20	50
		Possible damage to cultural heritage and religious sites	Indirect	10	20	10	40
		Possible involvements	Direct	20	20	20	60

		of children in collection activities					
		Possibility of accidents	Direct	20	20	10	50
		Possible natural hazards	Direct	10	20	20	50

Magnitude: This can be low-**L** (minor), medium-**M** (moderate), and high-**H** (major) depending on the scale or severity of change.

Geographical extent: If the action is confined to the project area, it is referred as site specific (**Ss**), if it occurs outside area but close to project area, the extent of impact is local (**Lc**), if it occurs far away from the project, it is referred as regional (**R**).

Duration: It can be short term (**St**-i.e. less than 3 years), medium term (**Mt**-i.e. 3-20 years), and long term (**Lt**-i.e. more than 20 years).

S.N.	Nature	Magnitude	Extent	Duration	Total
1.	**Direct**	Low (10)	Site Specific (10)	Short term (5)	General (25-50)
2.	**Indirect**	Moderate (20)	Local (20)	Medium term (10)	Moderate (51-75)
		High (60)	Regional (60)	Long term (20)	High (>75)

CHAPTER 6-ALTERNATIVE ANALYSIS

General

One of the key aspects of environmental studies of any project is the evaluation of potential alternatives. To achieve the objective the environmental and social considerations are needed to be brought into the planning from the early stages. In the case of this project, the main objective is to harvest Jatamasi in Humla district in a sustainable way in order to conserve the herb as well as to buttress the livelihood of the locals.

6.1 Collection Site Alternative

As the collection of Jatamasi only possible in the region with its availability and abundance, the areas with such criteria will be the collection sites. Therefore, the sites of other districts with vehicle transportation could be alternative to collection site as this district lack vehicle transportation. It will be easier to transport collected products to oil processing points present at different parts of the country.

6.2 No Action Alternative

Since Jatamasi is medicinal herb which is used to extract essence oil useful for various activities. Collection of herbs will raise the risk of getting extinct from the project area if harvested haphazardly. In order to protect the herb from being lost, no action alternative is to be used.

It is renewable natural resources. The wise and rational use of the renewable natural resource helps in sustainability. The collection of Jatamasi in appropriate way assures the sustainability. It helps in minimizing the weed competition, creates place for germination of new seedlings and also support in livelihood of local people. No action alternatives will impact the livelihood of locals, collection of revenue at local as well as national level. Thus, no action alternative is not viable in this project area.

CHAPTER 7- MITIGATION MEASURES

7.1 Impact on Physical Environment

7.1.1 Visual pollution in site

Awareness Programme

Awareness raising activities should be conducted for local collectors in order to produce less waste especially non-biodegradable plastics at the collection sites during collection periods.

Mitigation measures to be applied in order to minimize the impact of visual pollution are as:

- Collectors will be prohibited to take glass made apparatus which could physically harm humans and animals.
- Collectors will be informed to segregate the wastes into degradable and non-degradable wastes before disposal.
- After segregation, the collectors will be asked to bury degradable waste within vegetative sites.
- But, in case of non-degradable wastes, they will be disposed safely in pits away from water sources and vegetative cover.
- At the end of the collection time, those non-degradable wastes will be brought back to villages and disposed safely.

7.1.2 Possible change in micro climate

Awareness Programme:

Mitigation measures to be applied to minimize the impact on micro-climate of the site are as:

- Collectors will be made aware on the issue of minimizing use of fire wood.
- Collectors would be encouraged collecting firewood from nearby dense forests and priority should be given to collect fallen branches and naturally felled trees.
- Collectors would be insisted to minimize the waste of forest resources.

7.1.3 Reduction and pollution of water

Awareness Programme:

Mitigation measures for the protection of water sources from being polluted are as:

- Awareness programs will be conducted for collectors regarding importance of the water sources to collectors as well as to wildlife dwelling in the sites.
- Wastes generated in the collection site would be managed well and collectors will not be allowed to throw wastes in water sources.

Avoid putting tent near water source:

If collectors reside nearby the water sources in collection sites, there are more chances of water pollution. Therefore, the mitigation measures to minimize the chances are as:

- Collectors will not be allowed to put tents near water sources.
- Activities like defecation, washing clothes, utensils will not be allowed in the water sources of collection sites.

7.1.4 Soil erosion in hill top due to haphazard soil exposures

Awareness Programme:

- Only shallow dig will be allowed to the collectors during collection to minimize the chances of soil erosion.
- Only hand uprooting methods will be allowed to collect the Jatamasi to the collectors.

Fill the pit:

There may be the cases of deep uprooting which may cause water storage and even soil erosion if there is occurrence of heavy rainfall after collection activities.

In case of depth uprooting the rhizome, the pits will be filled and collectors will be made aware about it.

7.1.5 Dust pollution in collection sites

Action not needed:

There is insignificant chance of dust pollution in the collection site because the soil is wet which will not float on the air.

7.2 Impact on Biological Environment

7.2.1 Collection phase

7.2.1.1 Depletion of Jatamasi

DFO:

- District Forest Office will send instructions to concerned Village Councils and Forest User Groups to follow block wise collection every year.
- DFO will collect information on name of current harvesting block, details on harvesting sites within the block as well as details on the blocks where collection is restricted from the concerned Village Councils and Forest User Groups and monitor the activities.

CFUG:

- **User group** will train/ make aware their members and collectors for collection in designated block in their general assembly and also through other meeting.

Collection monitoring:

- Local Forest User Committee, Village Council and District Forest Office will monitor whether collection is done in designated block in proper way or not.

Supporting Jatamasi Farmer:

- Ilaka Forest Office will provide technical support on Jatamasi farming.
- Village Council will support cash for farming activities like buying seeds and weeding.

Action research:

District Forest office will initiate action research on practical issues in Jatamasi farming.

7.2.1.2 Disturbance to movement of wildlife

Awareness on wildlife conservation:

As those collection sites are the habitat of various kinds of wildlife, disturbance to their habitat, movements should not be disturbed. Therefore, mitigation measures to be applied are as:

- Activities generating loud noises will be not promoted.
- Activities hindering the movements and habitat of wildlife will be monitored and collectors will be made aware about it.
- Priority will be given for conservation and safety of wildlife through the meeting by CFUG, Village Councils and concerned Illaka Forest Office of DFO.

Minimization of disturbance:

- Collectors will be instructed to put tents away from wildlife hot spots and also to minimize playing music and to reduce campfires.

7.2.1.3 Damage to associated plants

Protection of associated species:

- Village Councils/ DFO and Forest User Groups will aware collectors not to damage other small or large associated species of Jatamasi at collection sites.

Movement in specific trails:

- While collecting Jatamasi, collectors will be instructed to move only in specific trails for minimizing damage to associated species.

7.2.1.4 Possible impact on important wildlife:

Maintaining distance with animal:

- Collectors will be encouraged to give priority to protected wildlife than their own needs in collection sites.
- Collectors will be instructed to maintain distance from wildlife and will be asked to give especial attention in terms of safety of the animals during their management of their food, shelter and cover.

Restrictions to collection:

Danphe are found in the collection sites and it is protected species of Nepal as well as National bird of Nepal, so they need to be protected in their habitats. Mitigation measures to be applied are as:

- Collectors will be instructed to leave those areas without any disturbances.

Awareness programme:

DFO/ Village Councils and FUGs will increase awareness among collectors on issues of possible impact on important wildlife in order to decrease the cases of chasing and disturbing or harming intentionally.

7.2.1.5 Illegal poaching, hunting and intimidation of wildlife:

Prohibition of guns and nets:

- Collectors will be strictly prohibited to carry guns and hunting nets during collection of Jatamasi.

Community Punishment:

- In case of possible damage to wildlife by collectors, local community will punish them according to socially acceptable norms.
- Culprits will be identified and will be punished as per the rules prepared through social acceptance.
- In case of severe crime such as ignorance of punishment and repeating crimes, criminal collectors will be sent to the District Forest Office for further actions.

Awareness programme:

Awareness programs regarding habitat protection of wildlife would be conducted at various levels.

7.2.1.6 Chances of forest or bush fire

Extinguishing cooking fire:

- Collectors will be instructed to extinguish the fire after cooking food items or heating bodies completely.

Tenting away:

- Collectors will be allowed to put their tents away from inflammable materials like dried firewood, dried leaf litter, dried twigs etc.
- In addition, collectors will be instructed to clean all the inflammable materials around the tent before putting tents and also to clean after tenting.

Awareness program:

- District Forest Office/ Village Council, forest user group will organize the awareness among the group of collectors to extinguish the fire mandatorily after cooking/heating.

7.2.1.7 Impact on upstream aquatic lives and their habitats of the small streams

Action not needed:

There is no water body in high altitudinal range where Jatamasi grows. Availability of water sources is highly scarce in Jatamasi collection site. So, there is no impact on upstream aquatic lives.

7.2.1.8 Loss of local biodiversity

Awareness program:

- District Forest Office/ Village Council, forest user groups will raise the awareness among the group of collectors to conserve the local wild animals and plants species through awareness programs before the collection period.

Diversify the use of firewood species:

- Collectors will be encouraged to minimize and diversify the utilization of firewood species.

7.2.2 Post Collection phase

7.2.2.1 Possibility of increase in poaching and hunting

Awareness program:

- Collectors will be informed that forest and grassland are the home for wildlife and they have the right to move in and around the Jatamasi site. So, poaching and hunting them is completely illegal and will be aware that such activities will be avoided on those areas.
- Forest User Groups and District Forest Office/ Village Council will raise awareness among the collectors about wildlife conservation.

Reinforcement of monitoring:

Forest User Groups, District Forest Office and Village Council will enhance the monitoring activities so that collectors do not get any chance for hunting by using the information received during Jatamasi collection.

7.3 Impact on Socio-economic and Cultural Environment Collection phase

7.3.1 Possibility of pressure on animal shed near to high altitude

Defecation away from water sources:

- Defecation and urination will not be allowed in and near water sources during collection periods.
- Water sources will not be polluted except water collection for drinking and washing.

Message board/ pamphlets:

- Message board or pamphlets will be pasted along the trails and sensitive zones mentioning the issues regarding water pollution and warning to keep water sources clean.

7.3.2 Possible damage to cultural heritage and religious sites

Awareness program:

- Collectors will be encouraged to conserve cultural and religious sites.
- They will be suggested to put tents away from those sites as possible.
- Collectors will not be allowed to scribble on the religious monuments or statues.

Message board:

- Message board will be pasted on the gate or entrances to the collection sites near to cultural sites mentioning the words importance of religious and cultural sites.

7.3.3 Possible involvements of children in collection activities

Aware household:

- The households of the collectors will be prohibited to take their children below 14 years for Jatamasi collection.

- Collector households will be made aware and informed about the prohibition of child labour and Children's rights.

School programme:
School programme should be conducted in each school to create awareness among students to reduce the child labour in Jatamasi collection. In addition, program will include the conservation education as well.

7.3.4 Possibility of accidents

Maintenance of trail:
- Village Council and Forest User Groups wil maintain the Jatamasi foot trails to minimize the possible accidents.
- Collectors will be encouraged to move through gentle slope and also to avoid steep slope as far as possible for better movement.

Use of appropriate shoes:
Collectors will be instructed to wear an appropriate type of shoe while going for the collection of Jatamasi and its transportation.

7.3.5 Possible natural health hazards

Carrying first aid kits:
- At least one first aid kit per group will be made mandatory for collectors during collection activities.

Use of masks:
- Use of mask will be made mandatory while drying and cleaning Jatamasi at households.

Rescue team
- At least a rescue team per group for the victims of altitude sickness will be formed with required trainings and skills.

CHAPTER 8-ENVIRONMENTAL MONITORING

General

Environmental monitoring is an important aspect of environmental management activities that consists of collection of data over the time to measure environmental changes associated with further operation of the plant. The Ministry of Population and Environment is responsible for the environmental monitoring of herbal resources projects in Nepal.

The Project Proponent, District Forest Office (DFO), Humla, will have the prime responsibility for the implementation of environmental monitoring program. The project Environmental Management Unit (EMU), the Project Manager, Consultant, Contractors and concerned authorities will be responsible for the environmental monitoring of different component of the project.

8.1 Types of Monitoring

Based on the study, type and size of the project and the monitoring experiences of other projects, daily to quarterly monitoring depending on the parameters will be conducted throughout the operation phase. Following types of environmental monitoring will be conducted in operation of the project.

8.1.1 Baseline Monitoring

Baseline monitoring is conducted to update the baseline condition of the proposed project. Baseline will cover the major components of physical, biological and socio-economic and cultural environment.

8.1.2 Impact Monitoring

Impact monitoring is to be carried out to assess the actual level of impact. The impact monitoring will be conducted during operation of the project. The impact monitoring will includes:

- Monitoring of the impacts rendered by the operation of the project on physical, biological and socio-economic environment of the area;
- Monitoring of the accuracy of the predicted impacts; and
- Monitoring of the effectiveness of mitigation measures.

8.1.3 Compliance Monitoring

The compliance monitoring will be conducted to monitor the compliance of the recommend mitigation measures and monitoring activities. To compliance monitoring will mainly focus on:

- Mitigation and monitoring requirements associated with the contractors will be duly incorporated in contract agreement.
- Compliance of the mitigation measures
- Monitoring of the allocation of adequate budget for the implementation of the mitigation measures and monitoring activities.

8.2 Environmental Monitoring Cost for Humla

Monitoring for Jatamasi collection will be carried by different three levels that include ministry and departmental level, local level; and user level. Monitoring team shall monitor whether the activity is implemented as mentioned in Sustainable Harvesting Plan for Jatamasi and Environmental Impact Assessment (EIA) report. Environmental monitoring cost for Jatamasi collection is estimated to be one crore and ten lakhs rupees (NRs. 1,10,00,000/-) which covers 13.33% of total revenue earned from Jatamasi. Detail breakdown of budget for five years with different levels has been estimated in table below.

Table 34: Environmental Monitoring Cost

Human Power Required	Budget in Each Year for Action					Total Budget
	First	Second	Third	Fourth	Fifth	
Ministry of Forest and Environment; and Ministry of Soil Conservation	300000	300000	300000	300000	300000	1500,000
District Forest Office, Village Council	150000	150000	150000	150000	150000	7500,000
Forest User Groups	400000	400000	400000	400000	400000	2000,000
Reporting, Printing and Stationery						
Grand Total	850000	850000	850000	850000	850000	11000000

Note: Budget for Forest user group shall be spent from concerned FUGs.

8.3 Monitoring Parameters, Schedule and Agencies Responsible

Table 35: Monitoring Parameters, Schedule and Agencies Responsible

Types	Parameters	Indicators	Methods	Schedule	Location	Responsibilities
A. **Baseline Monitoring**						
Physical Environment	Land Use	Coverage of Jatamasi in high altitudes	High altitude site observation	2nd and 3rd year before collection	Already Identified Project sites	DFO/Village Council and FUG
	Site Pollution	Haphazardly thrown plastics	Jatamasi site observation	During or immediate after collection	Project sites	DFO/Village Council and FUG
	Water Pollution	Presence of physically thrown plastics and human waste	Water source observation	During or immediate after collection	Project sites	DFO/ Village Council and FUG
Biological	Coverage	Changes in	Site	Before	Project	DFO/Village

Environment	of Jatamasi vegetation	Jatamasi cover pattern	observation and sampling	and after collecti on	sires	Council and FUG
	Damage to associated plants	Reduction in associated plant species	Site observation and sampling	Before and after collecti on	Project sites	DFO/Village Council and FUG
	Forest/ bush	Area brunt and intensity of fire	Fried area observation and measureme nt	After collecti on	Project sites	DFO/ Village Council and FUG
	Use of diverse species for firewood	Number of alternate species	Interview with collector	During the collecti on	Project sites	DFO/ Village Council and FUG
	Wildlife habitat	Wildlife habitat and conference	Site Observation	Once prior to collecti on	Project sites	DFO/ Village Council and FUG
Socio-economic and Cultural Environment	Maintenan ce of foot trail	Length of foot trails constructed or repaired	Measureme nt and observation	During the collecti on	Project sites	DFO/ Village Council and FUG
	Human accidents	Number of persons injured and death	Interview and discussion	During and after collecti on	Project sites	DFO/ Village Council and FUG
	Promotion of local enterprises	Number of Jatamasi based enterprises	Counting	After collecti on	Humla district	DFO
	Promotion of induced or other enterprises	Number of induced enterprises due to income from Jatamasi	Counting	After collecti on	Humla District	DFO
	Increase in employme nt	Number of employment increased	Counting or records of Jatamasi	After collecti on	Humla district	DFO
	Harvestin g skill employme	Number of skilled labor in harvesting	Observation and interview	During and after	Humla district	DFO

	nt			collecti on		
	Processing skill	Number of skilled labor in processing	Observation and interview	During and after collecti on	Humla district	DFO
	Increase in cash in hands in women	Number of women with cash in hands	Interview	After collecti on	Humla district	DFO and Women Development Office
	Revenue to governme nt	Number of women with cash in hands	Records in Village Council and DFO and FUG	After collecti on	Humla district	Ministry, Department, DFO Office, Village Council
B. **Impact Monitoring**						
Physical Environment	Visual Pollution	Wastes in collection sites	Direct Observation	During Collecti on	Collectio n sites	DFO/CFUG
	Possible change in micro climate	Loss of some vegetation/ animals	Field survey	Before collecti on	Collectio n sites and nearby forests	DFO/CFUG
	Pollution of water	Quality of water	Lab test of water	Before and after collecti on period	Upstream and downstre am of collection sites	MoEF
	Soil erosion in hill top	Soil exposed areas	Direct observation	After collecti on time	Collectio n sites	DFO and CFUG
	Dust pollution in collection sites	Quality of air and visual problems	Lab test of air and direct observation for visual problems	During collecti on	Collectio n sites	DFO and CFUG
Biological Environment	Loss of trees and shrubs	Number of trees and shrubs disturbed	Observation and discussion	Quarterl y	Project sites	DFO and CFUG
	Wildlife habitat loss and hinderance	Loss of habitats and less movement of	Field survey	Collecti on time	Collectio n sites	DFO and CFUG

	in movement	animals				
	Aquatic flors andfauna	Loss of aquatic flora and fauna	Field survey	Before and afger collecti on time	Upstream and downstre am of collection site	DFO and CFUG
Socio-economic Environment	Public Health	Types and occurrence of disease within the workers and local community	Discussion with the local people	Quarterl y	Project sites	DFO
	Local employment	Priority to the local people	Observation and checking working list	Annuall y	Project sites	DFO and CFUG
	Economic status	Changes in the economic condition of the local people	Observation and discussion	Annuall y	Project affected families	DFO and CFUG
C. **Compliance Monitoring**						
	Awareness program	Number of program to be conducted	Report review, KII, attendance sheet, Photograph s	Annual	Village	DFO/ Village Council/ User Groups
	Message board	Number of boards put	Field observation	During collecti on	Project sites	DFO/ Village Council/ User Groups
	Action Research for Farming	Number of Research	Research report	Annuall y	Research sites	DFO/Village Council/ User Groups
	Training to Jatamasi Farmer	Number of training and participation	Interview	Annuall y	During collection in collection sites	DFO/Village Council/User Groups
	School Program	Number of programs conducted	Reports	Annuall y	Before collection	DFO/ Village Council/User Groups
	Trail maintenance	Length of trails	Measureme nt	Annuall y	After colleciton	DFO/Village Council/ User Groups

	Support to accidents	Number of support given	Interview with accident households	Annuall y	After collection	DFO/ Village Council/ User Groups

8.4 Required Experts

Following experts will be required for the environmental monitoring of the proposed project.

Environmentalist
GIS Expert
Forestry expert

Botanist
Socio-economist
Field technician

CHAPTER 9-ENVIRONMENTAL MANAGEMENT PLAN

9.1 Introduction

This environmental management plan has two components; the environmental management activities and the activities implementing organization.

EMP is prepared to guide implementation of mitigation measures and monitoring requirements. It includes institution and their roles, environmental management activities, environmental management organizational structure as well as budget for mitigation measures.

The Ministry of Population and Environment is the main institution mandated to formulate and implement environmental policies, plans and programmes at the national level. It is also responsible for preparing and issuing environmental regulations and guidelines; development and enforcement of environmental standards; pollution control, commissioning environmental research and studies; and monitoring of programmes implemented by other agencies.

9.2 Institutions and their roles

Ministry of Population and Environment is responsible for all formulation of policies, plans and programs for the conservation of environment. It is even responsible for monitoring the mitigation measures of the project.

District Forest Office (DFO): DFO is the proponent of the project; therefore there are many responsibilities in its head. It is responsible for the monitoring the activities that may harm to the forest, wildlife and water bodies in the collection sites as well as on the foot trails. It is even responsible for the safety of the collectors. It is even responsible for monitoring the correct use of block methods during collection. It is responsible for the sustainable collection of Jatamasi in the collection sites.

Village Council (VC): It is responsible for monitoring the proper use of blocks as per rules by the collectors. It is responsible to carry on awareness programs frequently in order to conserve the herbs and its associates in the collection sites.

Community Forest User Group (CFUG): Since the collection sites lie inside the community forests of the area, the CFUG is also responsible for maintenance of the forests. It is responsible to aware people about minimum use of forest products and avoid forest fires activities.

Environmental Management Unit (EMU): The environmental management unit will be established for day to day environmental management of the project, implementation of proposed mitigation measures and to carry out environmental monitoring plan. The unit will be responsible to monitor the environmental factors of the collection sites like air, water,

vegetation, soil and so on. It will be responsible to handle the activities that may pollute environment and harm the wildlife as well as forests.

9.3 Environmental management Plan for Humla

Total environmental management activity budget is estimated to be one crore five lakhs eighty thousand rupees (NRs. 1, 05, 80,000/-) which covers 41.5% of the total revenue from 1700 tons in years. The detail breakdown of the budget is given in table below.

Table 36: Environmental Management Plan

Activities	Unit	Total Quantity	Year of Action					Unit Rate (NRs.)	Estimated Budget (NRs.)
			First	Second	Third	Fourth	Fifth		
Awareness Program	No.	38	14	0	14	0	10	35,000	13,30,000
Message Board	No.	100	100	0	0	0	0	2,000	2,00,000
Action Research for farming	No.	1	All Years					1200000	12,00,000
Training to Jatamasi Farmer (2 days)	No.	6	6	0	0	0	0	200,000	1200,000
Follow up training to Jatamasi Farmers (1 day)	No.	4	0	2	0	2	0	100,000	4,00,000
School Program	No.	28	0	28	0	0	0	50,000	14,00,000
Maintenance of trail	As per need		First Year	0	0	0	0	7,00,000	7,00,000
Maintenance of trail	As per need		0	Second Year	0	0	0	7,00,000	7,00,000
Maintenance of trail	As per need		0	0	Third Year	0	0	7,00,000	7,00,000
Purchase of Mask	As per need		First Year	0	0	0	0	1,00,000	1,00,000
First Aid Kit	As per need		First Year	0	0	0	0	2,00,000	2,00,000
Relief for victim's family	As per need		All years					1400000	14,00,000
Total									102,30,000

9.4 ENVIRONMENTAL AUDIT

The project will make necessary arrangements for this Audit through GON or its nominated auditor. The role of the environmental auditor is to identify environmental change arising from the project and to assess the effectiveness of the mitigation measures adopted, suggesting additional measures where appropriate. In addition, auditing of the project will indicate where initial predictive methods were weak or environmental knowledge lacking, thus indicating areas where further research or attention to detail may be necessary.

Additionally, close liaison with the implementing agency will secure valuable insights into the EA process and strengthen the capacity of the agency.
The environmental auditor needs to record the nature and scale of actual changes to baseline conditions and compare them with the predicted impacts. Where mitigation measures have been adopted, some assessment of their effectiveness must be made. Where measures are inadequate or impacts unforeseen, a strategy for restoration needs to be formulated in consultation with the relevant bodies. It is also essential that the effectiveness of mitigation measures be assessed over time to ensure that temporary stopgap solutions are not employed and that any gradual, but potentially serious, deterioration in environmental quality is detected.

The function of the environmental audit may, therefore, be summarized as follows:

- Verify compliance with the stated mitigation/performance targets
- Verify compliance with relevant environmental legislation
- Ensure minimum human exposure to environmental risk
- Advice on environmental improvements
- Liaise closely with the parties involved in the monitoring process and initiate a counterpart program for the audit to ensure institutionally memory;
- Review the overall success of the project in relation to its environmental goals and suggest where improvements in procedure could be made in the future

9.5 AGENCIES RESPONSIBLE FOR AUDITING

The project will be responsible for the auditing activities after the further operation of the project as per the Environmental Protection Regulation of the Government of Nepal. However, agencies like the Ministry of Population and Environment, Department of National Parks and Wildlife Conservation, Ministry of Water Supply and Sanitation and other relevant organizations will be consulted during the auditing. Local NGOs and National NGOs may also be entrusted to carry out the task, if they are engaged to do so by the government.

The auditing should focus on impacts of forest resources utilization, human wildlife conflicts, drainage pattern of water source, and water availability to downstream community and other pollution, etc. The auditing of the project will focus on parameters as mentioned in table above.

Environmental Auditing Schedule

Environmental Audit will be carried out along the further commencement of the project. However, audit during the operation phases of the project lies in the jurisdiction of auditing agency.

9.6 PROJECT BENEFITS AND COSTS

Every developmental activity involves certain costs associated with the operation and maintenance of the works undertaken. However, such activities also accrue benefits to the local people, society and the nations as a whole. All the project benefits ad cost cannot be quantifiable and are intangible in nature. Hence, the benefits and cost mentioned below include the cost and benefits of the project in general. This project also includes certain costs and benefits during the operation phase which are envisaged in the following sections. Following benefits and costs are anticipated from the project during its operation:

Every developmental activity involves certain costs associated with the operation and maintenance of the works undertaken. However, such activities also accrue benefits to the local people, society and the nations as a whole. All the project benefits ad cost cannot be quantifiable and are intangible in nature. Hence, the benefits and cost mentioned below include the cost and benefits of the project in general. This project also includes certain costs and benefits during the operation phase which are envisaged in the following sections. Following benefits and costs are anticipated from the project during its operation:

9.6.1 Benefits during Collection Phase

The benefits during operation phase are accounted in socio-economic basis which are mentioned below:

- Increase national revenue through its export to international markets.
- Uplift the economic status of local people through job opportunities.
- Increase in trade and commerce
- Enhancement of local infrastructures

9.6.2 Benefits during Post Collection Phase

- Contributions to increase in income and living standards of local communities
- Contribution in promotion of herbal industry
- Enhancement in local women empowerment, as most of the collectors will be women.

9.7 Costs of the Project

Net present value: Net present value at 10% discount rate is positive which amounts to NRs. **75,36,02,500** (Seventy five crore thirty six lakh two thousands five-hundreds). This positive figure shows project is feasible for implementation.

Benefit cost ratio: Benefit cost ratio is 1.93. It means an investment of NRs. 1 rupee will return NRs. 1.93. Benefit cost ratio more than one signifies the implementation of the project.

Table 37: Costs of the Project

S.N.	Cost Items	Total	Percentage in total cost
1.1	Environmental Mitigation and Enhancement Cost	1,29,10,000	1.7
1.2	Environmental Monitoring Cost	43,00,000	0.57
1.3	Environmental Audit Cost	50,00,000	0.66

Table 37 shows ratio of environmental mitigation and enhancement cost with the total costs is 1.64% while the ratio of monitoring cost is 0.52%. Similarly, it is 0.16% in case of environmental audit cost.

Table 38: Cost of the project for the first year

S.N.	Cost for first year	Rate	Day	Person	Kg	Amount
C1	Jatamasi collection cost	250	-	-	4,25,000	10,62,50,000
C2	Transportation cost	105	-	-	4,25,000	4,46,25,000
C3	Drying, cleaning and packaging cost	4	-	-	425,000	17,00,000
C4	Loading/unloading and storage cost	9			425,000	3825000
C5	Communication cost	1500		15		22500
C6	Trader's lodging/fooding	2000	1	225		450,000
C7	Trader's wage	1000	1	225		225,000
C8	Mitigation and Enhancement cost					4240,000
C9	Monitoring Cost					875000
C10	Audit cost					10,00,000
C11	EIA preparation cost					500000
	Total					**163712500**
	Benefit for First Year					
B1	Total Quantity of Jatamasi	700			425000	297500000
B2	Royalty to DDC and DFO/FUG	35			425000	14875000
	Total					**312375000**

Table 39: Cost of the project for the second year

S.N.	Cost for the second year	Rate	Day	Person	Kg	Amount
C1	Jatamasi collection cost	250	-	-	4,25,000	10,62,50,000
C2	Transportation cost	105	-	-	4,25,000	4,46,25,000
C3	Drying, cleaning and packaging cost	4	-	-	425,000	17,00,000
C4	Loading/unloading and storage cost	9			425,000	3825000
C5	Communication cost	1500		15		22500
C6	Trader's lodging/fooding	2000	1	225		450,000

C7	Trader's wage	1000	1	225		225,000
C8	Mitigation and Enhancement cost					3150,000
C9	Monitoring Cost					875000
C10	Audit cost					1000000
C11	EIA preparation cost					00
	Total					**162122500**
	Benefit for second Year					
B1	Total Quantity of Jatamasi	700			425000	297500000
B2	Royalty to DDC and DFO/FUG	35			425000	14875000
	Total					**312375000**

Table 40: Cost of the project for the third year

S. N.	Cost for Third Year	Rate	Day	Person	Kg	Amount
C1	Jatamasi collection cost	250	-	-	425000	
C2	Transportation cost	105	-	-	425000	44625000
C3	Drying, cleaning and packaging cost	4	-	-	425000	1700000
C4	Loading/unloading and storage cost	9	-	-	425000	3825000
C5	Communication cost	1500	-	15	-	22500
C6	Trader's lodging/fooding	2000	1	225	-	450000
C7	Trader's wage	1000	1	225	-	225000
C8	Mitigation & Enhancement cost	-	-	-	-	1840000
C9	Monitoring cost	-	-	-	-	875000
C10	Audit cost	-	-	-	-	1000000
	Total					**160812500**
	Benefit for Third Year					
B1	Total Quantity of Jatamasi	700	-	-	425000	297500000
B2	Royalty to DDC and DFO/FUG	35	-	-	425000	14875000
	Total					312375000

Table 41: Cost of the project for the fourth year

S. N.	**Cost for Fourth Year**	**Rate**	**Day**	**Person**	**Kg**	**Amount**
C1	Jatamasi collection cost	250	-	-	425000	
C2	Transportation cost	105	-	-	425000	44625000
C3	Drying, cleaning and packaging cost	4	-	-	425000	1700000
C4	Loading/unloading and storage cost	9	-	-	425000	3825000
C5	Communication cost	1500	-	15	-	22500
C6	Trader's lodging/fooding	2000	1	225	-	450000
C7	Trader's wage	1000	1	225	-	225000
C8	Mitigation & Enhancement cost	-	-	-	-	1840000
C9	Monitoring cost	-	-	-	-	875000
C1	Audit cost	-	-	-	-	1000000

0						
	Total					**160822500**
	Benefit for Fourth Year					
B1	Total Quantity of Jatamasi	700	-	-	425000	297500000
B2	Royalty to DDC and DFO/FUG	35	-	-	425000	14875000
	Total					312375000

Table 42: Cost of the project for the fifth year

S. N.	**Cost for Fifth Year**	**Rate**	**Day**	**Person**	**Kg**	**Amount**
C1	Jatamasi collection cost	250	-	-	425000	
C2	Transportation cost	105	-	-	425000	44625000
C3	Drying, cleaning and packaging cost	4	-	-	425000	1700000
C4	Loading/unloading and storage cost	9	-	-	425000	3825000
C5	Communication cost	1500	-	15	-	22500
C6	Trader's lodging/fooding	2000	1	225	-	450000
C7	Trader's wage	1000	1	225	-	225000
C8	Mitigation & Enhancement cost	-	-	-	-	1840000
C9	Monitoring cost	-	-	-	-	875000
C10	Audit cost	-	-	-	-	1000000
	Total					**160812500**
	Benefit for fifth Year					
B1	Total Quantity of Jatamasi	700	-	-	425000	297500000
B2	Royalty to DDC and DFO/FUG	35	-	-	425000	14875000
	Total					312375000

Table 43: Summary of total costs and benefits

S. N.	Cost Streams	Years				
		First	Second	Third	Fourth	Fifth
C1	Jatamasi collection cost	106250000	106250000	106250000	106250000	106250000
C2	Transportation cost	44625000	44625000	44625000	44625000	44625000
C3	Drying, cleaning and packaging cost	1700000	1700000	1700000	1700000	1700000
C4	Loading/ unloading and storage cost	3825000	3825000	3825000	3825000	3825000
C5	Communication cost	22500	22500	22500	22500	22500
C6	Trader's lodging/fooding	450000	450000	450000	450000	450000
C7	Trader's wage	225000	225000	225000	225000	225000

C 8	Mitigation and Enhancement cost	4240000	3150000	1840000	1840000	1840000
C 9	Monitoring Cost	875000	875000	875000	875000	875000
C 10	Audit cost	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000
C 11	EIA preparation cost	500000	0	0	0	0
	Total	**16,37,12,500**	**16,21,22,500**	**1608,12,500**	**160812,500**	**16,08,12,500**
B 1	Total Quantity of Jatamasi	297500000	297500000	297500000	297500000	297500000
B 2	Royalty to DDC and DFO/CFUG	14875000	14875000	14875000	14875000	14875000
	Total	**312375000**	**312375000**	**312375000**	**312375000**	**312375000**

9.8 Cost Benefit Analysis (in terms of Nepalese currencies)

The cost and benefits of the project is analyzed as:

Table 44: Cost Benefit Analysis

Year	**Costs**	**Benefits**	**Net Benefit**
First	**16,37,12,500**	312375000	14,86,62,500
Second	**16,21,22,500**	312375000	15,02,52,500
Third	**16,08,12,500**	312375000	15,15,62,500
Fourth	**16,08,12,500**	312375000	15,15,62,500
Fifth	**16,08,12,500**	312375000	15,15,62,500
Total	**480,82,72,500**	**1,56,18,75,000**	**75,36,02,500**

CHAPTER 10-POLICIES, LAWS, RULES AND MANUALS

The relevant national environmental legislations including constitution, policies and plans, acts and regulations, manuals/guidelines, international conventions and treaties, and standards has been carried out and presented hereunder.

10.1 Constitution of Nepal

Constitution of Nepal-Part-3 Fundamental Rights to Properties

Constitution of Nepal-Part-3 Fundamental Rights and Properties- under article 25: Right to Property states that subject to laws every citizen has the right to acquire, enjoy own, sell, have professional gains and otherwise utilize, or dispose of property.

The relevant environmental aspects covered by the Constitution of Nepal 2072 BS include right of clean environment of the people, natural resources protection, preservation and its prudent use. The constitution also emphasizes on right of clean environment of the people, natural resources protection, preservation and its prudent use. Rights regarding clean environment: under article 30:

Right of each person to live in a healthy and clean environment.

The victim of environmental pollution and degradation shall have the right to be compensated by the pollutant as provided for by law.

Likewise the Constitution offers: Policy regarding the conservation, management and use of natural resources.

10.2 Plans and Policies

10.2.1 Fourteenth Three Year Plan, 2073-2076)

The fourteenth plan has identified EIA as a priority area, as it emphasizes on environmental monitoring of the project that have undergone EIA process. The Plan focuses on the need for setting up national environmental standards with strategy of internalizing environmental management into the development programs. The Plan has also realized to carry out Strategic Environmental Assessment (SEA) with the long-term policy of promoting environmental governance. The Plan emphasizes on the local participation in environmental conservation, as envisaged in the Local Self Governance Act, 2055, through the local bodies, make them responsible and capable to manage local natural resources.

The long-term vision of environmental management is to create a clean and healthy environment through effective environmental management and to achieve sustainable development through the wise use of natural resources. By integrating environmental aspects in social and economic development programs through Environmental Assessment (EA) system, improvements will be made in the quality of environment by means of environment friendly development. Road projects will be formulated and constructed based on methods that optimally utilize the local skill and resources and generate employment opportunities.

10.2.2 Forest Policy 2015

The document has seven policies to fulfil forestry sector objectives. Out of seven, policy number six says that mitigation and adaptation measures will be implemented to reduce negative effects of climate change. Under this policy there are 3 strategies. Under these 3 strategies, there are 12 working strategies. Some of the major working strategies are as below:

- Adaptation measures will be implemented to support forest resource conservation, watershed management, food security, water induced disaster control.
- Arena of carbon conservation will be broadened also through sustainable forest management.
- For encouraging carbon conservation, fixed percent of revenue from forest products sales will be used in forest fire control and other conservation measures.
- Appropriate technologies will be identified, developed and used to reduce negative effects of climate change.
- Forest management plans will be made in climate change friendly way.
- Regular study, research and monitoring will be done to minimize risk and effect of climate change in local ecosystems.

10.2.3 National Biodiversity Strategy and Action Plan (NBSAP) (2014-2020)

This National Biodiversity Strategy and Action Plan (NBSAP) is a revised and updated version of the Nepal Biodiversity Strategy (NBS). It builds on the achievements and lessons learned from National Biodiversity Strategy and Action Plan Page 3 implementation of the NBS. It is prepared by taking into considerations of the national needs in terms of conservation of biodiversity, sustainable use of its components and equitable sharing of benefits accrued from conservation and utilization of genetic resources. Relevant decisions and guidelines of the CBD Conference of Parties (COP), particularly the COP 10 Decision X/2 on Strategic Plan for Biodiversity 2011–2020 adopted by the Parties in October 2010, and the Aichi Biodiversity Targets provided theoretical framework and technical guidance for developing the NBSAP. The NBSAP has been prepared by the Ministry of Forests and Soil Conservation with funding support of the Global Environment Facility through the United Nations Environment Programme.

10.3 Acts

10.3.1 CITES Act, 2074

Government of Nepal has enacted CITES act, which has made mandatory to follow CITES provision use any parts of plant or animals, which are listed in CITES appendices.

10.3.2 Environment Protection Act, 2053 BS (1997 AD)

Section 3 of the act requires the proponent to conduct an IEE or EIA of the proposal as prescribed. Section 4 prohibits implementing the proposal without getting the IEE/EIA approved from the concerned authority. Section 6 deals on the approval procedures. Section 8 empowers the ministry to appoint “environmental inspectors”. Section 18 has provisions for punishment.

10.3.3 Forest Act, 2049 BS (1993 AD)

Forest Act 2049 has categorized different types of forest and management plan is made compulsory for harvesting the forest products.

10.3.4 Child Labor (Prohibition and Regulation) Act, 2056 BS (2000 AD)

As per section 3 of this act, No child having not attained the age of 14 years shall be engaged in works as a labourer.

10.3.5 National Parks and Wildlife Conservation Act, 2029 BS (1973 AD) (with amendments)

This act addresses for conservation of ecologically valuable area and indigenous wildlife. Annex 1 of the act has listed 26 species of mammals, 9 species of birds and 3 species of reptiles as protected wildlife.

10.3.6 Soil and Watershed Conservation Act, 2039 BS (1982 AD)

Soil and Watershed Conservation Act, 1982 attract as and when slide or erosion within road is surfaced up significantly.

10.3.7 The Tourism Act, 1978

This Act also contains provisions to minimize waste and environmental pollution in the trekking areas. Scattered regulatory measures are also available in other sectoral laws but they do not clearly spell out the need for EIA studies.

10.3.8 Local Governance Operation Act 2074

The provisions entailing the authority and responsibilities of the local government concerning the areas of health, education, water and sanitation, electricity, agriculture and irrigation, poverty alleviation, livestock, food security and social security.

10.4 Rules and Regulations

10.4.1 Environment Protection Rules, 1997, (with amendments)

Rule 4 of the regulation briefs scoping exercise. Rule 7 urges the proponent to collect comments/suggestions regarding the proposal through a "public hearing" during the preparation of EIA report. Rule 10 suggests submitting recommendations received from affected VDCs/municipalities along with the IEE/EIA report. Rule 11 advices the ministry (MoPE) to publish a 30 days public notice in any national level daily newspaper requesting for comments and suggestions on the EIA (draft) report. Rule 13 deals with environmental monitoring. According to this rule, the concerned ministry is responsible for such monitoring. Rule 14 mentions the ministry (MoPE) to conduct environmental auditing and keep updated auditing records. Schedule 3 and 4 are the ToR format for IEE and EIA respectively. Matters to be covered in IEE and EIA are given in schedule 5 and 6 respectively.

10.4.2 Forest Rules, 2051 BS (1995 AD)

10.4.3 Labor Rules 2050 BS (1993 AD)

Rule 3 has set time duration for deploying minor at work and rule 4 has set time duration for deploying woman at work

Rules 15, 16 and 17 are concerned with compensation against injury, grievous hurt resulting in physical disability and death respectively.

Rules 38, 39, 40, 41, 42, 43 and 44 are concerned with health, cleanliness and safety.

10.4.4 National Parks and Wildlife Conservation Rules 1974

The rules explain the procedure to provide hunting license for the animals and birds which are legally allowed to hunt in specified hunting area as well as government's fees for those licenses. The rules also explain procedure to give ownership for the trophies acquired from the hunted animals.

10.5 International Conventions and Treaties

10.5.1 Convention on Biological Diversity, 2049 BS (1992 AD)

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

10.5.2 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 2053 BS, amended, 2059 BS (1973 AD, amended 1979 AD)

The convention classifies species according to criteria where access or control is important (e.g. I-species threatened with extinction; II-species which could become endangered; III-species that are protected; E-Endangered; V-Vulnerable, R–Rare (CITES, 1983). The project will have to minimize impacts to the CITES species as far as possible.

10.5.3 ILO Convention Article, 169 (Indigenous and Tribal Peoples Convention, 1989)

ILO Convention 169 is a legally binding international instrument open to ratification, which deals specifically with the rights of indigenous and tribal people. The convention does not define who indigenous and tribal people are. Self-identification is considered as fundamental criterion for the identification of indigenous and tribal peoples based on tradition, culture and way of life, own social organization and traditional custom and laws. It takes a practical approach and only provides for describing the peoples it aims to protect. Nepal is a signatory to this legal instrument.

10.5.4 UN Declaration on Rights of Indigenous Peoples (2007)

The Declaration is structured as a United Nations resolution, with 23 pre-ambular clauses and 46 articles. Articles 1–40 concern particular individual and collective rights of indigenous peoples; many of them include state obligations to protect or fulfil those rights. Article 31 concerns the right to protect cultural heritage as well as manifestations of their cultures including human and genetic resources. Articles 43–45 indicate that the rights in the declaration apply without distinction to indigenous men and women, and that the rights in the Declaration are "the minimum standards for the survival, dignity and well-being of the indigenous peoples of the world," and do not in any way limit greater rights. Nepal is a signatory to this legal instrument.

10.6 Strategies

10.6.1 National Conservation Strategy (2045 BS)

The national Conservation Strategy endorsed includes a number of programs while implementing any projects. It focuses on sustainable use of resources and compatible land use. The strategy stresses the need to ascertain the potential consequences of the development activities on the environment and urges to minimize detrimental effects.

10.6.2 Nepal Biodiversity Strategy, 2002 AD

The Nepal Biodiversity Strategy has emphasized to conduct EIA in accordance with the provision of EPA/EPR 1997 to assess significant impacts of development activities on biodiversity. The strategy has given emphasis to ensure effective implementation of the existing laws regarding environmental assessment.

10.7 Manuals/Guidelines

10.7.1 Resource Inventory Manual for Non timber Forest Products, Department of Forests, 2068

The guidelines have given tips for conducting inventory for major NTFP in Nepal. Also explains how sample could be laid out and measurements should be conducted.

10.7.2 Botanical Resource Research Manual, 2070

The guidelines have established process for giving permission to other by government and also proposed a committee for quality control on the researches.

10.7.3 National Environmental Impact Assessment Guidelines 2050 BS (1993 AD)

The guideline assists mechanisms for conducting Environmental Impact Assessment. Further, it guides in project screening, scoping, identifying project impacts, adopting mitigation measures, monitoring, evaluating impacts, community participation, and report preparation.

10.7.4 Guidelines to prepare EIA Report, MoPE, 2006

The Environmental Guidelines published by MoPE (2006) contains the following components:

Methods for screening of the projects requiring an application of Environmental Assessment Scoping, impact identification and prediction, report review, monitoring and evaluation and impact auditing;

Methods for ensuring public participation during the preparation of the EIA report, including the need for clear documentation of the impact mitigation measures in the EIA report;

Provisions for identifying socio-economic-cultural, biological, and physical impacts and prescription of mitigation measures to avoid, eliminate and/or minimize adverse effects and to augment beneficial impacts resulting from the project implementation; and

Emphasis on the adoption of monitoring, evaluation and environmental auditing frameworks in the EIA report.

10.7.5 Environmental Impact Assessment Guideline, 2072 BS (Draft)/MoPE, 2015

This document has provided clear guidelines for Reporting Formats and other Methods and Standards for:

- Scoping, Terms of Reference (ToR), IEE/EIA report
- Environmental Impact Assessment Report Review guideline
- Selection of EIA Report Review Experts and Roaster preparation method and Schedule
- Format of Public Notice and other methods and Standards

CHAPTER 11-ENVIRONMENTAL IMPACT AUDIT

General

The operation environmental impact audit will be carried out to assess environmental impacts, accuracy of predictions, the effectiveness of mitigation measures and the monitoring plan. Ministry of Population and Environment will carry out the Environmental Impact Audit of the Project after 2 years of the further operation of the project.

The Environmental Impact Audit plan for physical, biological and socio-economic and cultural environment is described as:

11.1 Physical Environment

Following matters shall be covered under the physical environment:

- Changes in the baseline condition in the physical environment of the project area after the project operation;
- Accuracy of the predicted impacts;
- Magnitude of the predicted impacts;
- Effectiveness of the mitigation measures;
- Compliance with the recommendations and findings of EIA report;
- Effectiveness of compliance monitoring system.

11.2 Biological Environment

Following matters shall be covered under the biological environment:

- Changes in baseline condition in the biological environment of the project area after further operation of the project;
- Accuracy of the predicted impacts;
- Magnitude of the predicted impacts;
- Effectiveness of the mitigation measures;
- Compliance with the recommendations and findings of EIA report;
- Effectiveness of compliance monitoring system.

11.3 Socio-Economic and Cultural Environment

Following matters shall be covered under the socio-economic and cultural environment:

- Changes in baseline condition in the socio-economic and cultural environment of the project area after further operation of the project;
- Accuracy of the predicted impacts;
- Magnitude of the predicted impacts;
- Effectiveness of the mitigation measures;
- Compliance with the recommendations and findings of EIA report;
- Effectiveness of compliance monitoring system.

11.4 Approach and Methodology

Environmental Impact Audit program will follow the same methodology and survey sites covered in Environmental Impact Assessment Study and monitoring report. Review of monitoring report, field visit and use of checklist, meeting and discussion with the local

community, CFUG, Village Council, VDC, and DDC shall be the main methodologies to be adopted for the environmental impact audit.

11.5 Schedule

The Environmental Impact Audit of the project shall be conducted after 2 years, as per EPR, 2054. The estimated time for the audit is proposed to be 6 months.

11.6 Experts

The Environmental Impact Audit requires a team of multidisciplinary experts with relevant experiences in such project. Following team is proposed for environmental impact audit of the project.

Environmentalist
GIS Expert
Forestry expert

Botanist
Socio-economist
Field technician

11.7 Estimated Costs

The estimated cost to carry out the environmental impact audit is 10,00,000 Nepalese Rupees including the experts, transportation and report production. The detail environmental impact audit cost is presented in the given below:

Table 45: Estimated Cost

S.N.	Particulars	Human Resources	Rate (NRs.)	Amount for five Years
1.	Experts			
1.1.	Team Leader	1	20,000	80,000
1.2.	GIS Expert	1	20,000	80,000
1.3.	Forest Expert	1	20,000	80,000
1.4.	Botanist	1	20,000	80,000
1.5.	Socio-economist	1	20,000	80,000
1.6.	Field Technician	4	10,000	40,000
	Sub-Total			**4,40,000**
2.	Out of Pocket Expenses			
2.1.	Transportation			1,00,000
2.2.	Report Production			40,000
2.3.	Data Collection, and Sampling			4,00,000
	Lab test, etc.			
2.4.	Miscellaneous			20,000
	Sub-Total			**5,60,000**
	Grand Total			**10,00,000**

11.8 Organizational Responsibility

Ministry of Population and Environment will be the legally responsible organization for the Environmental Impact Audit work of the project as per the EPR, 2054

CHAPTER 12-CONCLUSION

The project area, Humla is the second largest district of the country. Jatamasi is widely distributed in the area. As per the calculation, about 154468 Ha land of the district is found to be appropriate for the harvesting of Jatamasi. About 425 tons dry Jatamasi will be harvested from the project area and collected in the DFO, the proponent of the project.

There will be block rotation method in the collection sites for the conservation of Jatamasi at the collection sites. These rules will be strictly implemented and monitored by DFO, CFUG, Village Council and other concerned authorities.

The collection of Jatamasi has become the one of the income generating field for the locals of the area. Collection of Jatamasi will help to boost the economic standard of the locals of Humla which will help to alienate the poverty prevailed in the area.

With proper monitoring and implementation of mitigation measures, the project will have many beneficial impacts to the locals of project site.
Therefore, sustainable harvesting of the Jatamasi project is feasible for the project area for the development of locals as well as the district as a whole.

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Non-detrimental findings for

Nardostachys grandiflora DC. From Nepal

Prepared by

Madhu Devi Ghimire

Kalpana Sharma Dhakal

Issued by Scientific Authority of CITES
Department of Plant Resources
Ministry of Forests and Environment
Government of Nepal
Kathmandu

19 September 2019

Government of Nepal
Ministry of Forests and Environment
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Ref. No.: 2076/77-242

Date: 22 September 2019

To
The Department of Forests and Soil Conservation
Babar Mahal, Kathmandu

Subject: Submission of Non - detriment findings report for *Nardostachys grandiflora*

As per the recommendation of the CITES plant committee and decision of CITES standing commitee (SC71 Doc. 12), Nepal is requested by Standing Committee to prepare revised precautionary export quota of *Nardostachys grandiflora* for 2019, along with a justification. Department of Plant Resources, Scientific Authority for CITES plant has prepared non- detriment finding for *Nardostachys grandiflora* with revised precautionary quota as 382.7 M. ton per year for 2019 on scientific basis. The approved NDF report is attached here with to forward it to CITES Secretariat as per the direction.

Kalpana Sharma (Dhakal)
Asst. Scientific Officer
198482

Table of Contents

Abbreviations

AAH :	Annual Allowable Harvest
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DFMP :	District Forest Management Plan
DFO :	District /Division Forest Office
DFO :	District Forest Officer, Divisional Forest Officer
DoF :	Department of Forests (then)
DoFSC:	Department of Forests and Soil Conservation
DNPWC:	Department of National Parks and Wildlife Conservation
DPR :	Department of Plant Resources
EIA :	Environmental Impact Assessment
IEE :	Initial Environmental Examination
MAPs :	Medicinal and Aromatic Plants
MFSC :	Ministry of Forests and Soil Conservation (then)
MoFE :	Ministry of Forests and Environment
NWFP :	Non-wood Forest Product

Date :09/19/2019

Non-detriment findings for *Nardostachys grandiflora* (Jatamansi) from Nepal

Summary

Nepal is one of the prime resource country for the Jatamansi. This valuable species is distributed in over 27 districts of High Mountains and Himalaya Region of Nepal. It is categorized as the IUCN Red list of **'critically endangered'** and CITES Appendix II list. The global population of the species has been declined as shown in various studies. However, its population status has not declined as claimed due to the Government's robust conservation, management and utilization legislations, plans and programs to ensure the sustainability. The Non-detrimental finding of the Jatamansi has been prepared following the checklist to assist in making NDF for Appendix II exports. Collective scoring was done in the participation of major stakeholders to plot the radar graph based on 26 different factors which affect the management of the harvesting regime of the Jatamansi. The radar produces a central area of color depicting the proposed harvest is likely to be non-detrimental. Both the management and scientific authorities of Nepal had estimated a total of 935 M Tons annual quota of dry rhizomes and their derivatives equivalent to be non-detrimental for 2019 in the last submission to CITES Secretariat. However, with the suggestions from the reviewer and CITES Secretariat the precautionary quota proposed to be 10% of the total growing stock of each available district with the rotation period (RP) of 5 years which is a total of 382.7 M Tons per year. The department ensures regular monitoring and the complete adherence with the CITES provisions and national laws for the sustainable utilization of the Jatamansi resources and its habitat. The Department of Plant Resources, scientific authority, has prepared the NDF in close coordination with Department of Forests and Soil Conservation which is the management authority for Nepal.

Keywords: Jatamansi, Harvest, Population Management, Sustainability, Initial Environmental Examination, Environmental Impact Assessment, District Forest Management Plan

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1.0 Background Information on the Taxa

Nardostachys grandiflora DC. (Syn.*Nardostachys jatamansi* (D.Don) DC.) is a dicotyledonous flowering plant which belongs to the family Caprifoliaceae. This species is distributed throughout the Himalayan region. It is a perennial herb growing in rocky slopes, rock outcrops, meadows, shrub land and forests from 3200m to about 5000m altitude. It is slow growing plant species regenerated from rhizome and seeds. The semi-processed products (essential oil and marc) from rhizomes are exported to different countries from Nepal. Moreover, the demand for the hydrolates, also known as hydrosols or floral water produced as the byproduct of Jatamansi distillation is increasing and the manufacturers are willing to export this product from Nepal.

It is one of the most important commodities for supporting the livelihood of rural people of Mountainous regions in Nepal. The status of the plant population and its growing stocks has been studied in all major Jatamansi resource districts of Nepal. The growing stock of this

species has been increasing in Nepal as the Government of Nepal has put various stringent conservation and management plans, programs and activities.

This species has been enlisted in CITES appendix II in 1997 as the population of the species has been declined due to the over exploitation and commercial trade throughout its range countries. However, Nepal has taken very stringent measures to regulate the harvesting of the species that ensures its sustainable utilization. The species is banned to export in raw form (without processing) since 2000 AD. The export was comparatively very small in the early years as the processing industries were very limited. However, its trade volume increased in the last five years, before its ban completely imposed by Nepal, as the number of processing industries establishment increased. The Government of Nepal has been implementing various activities for the sustainable utilization of the species. As per the suggestions from CITES Secretariat and Plant Committee, the Government of Nepal has prevented even the collection, domestic trades and international exports of the species since May, 2017. That has increased the growing stock of the species. However, it has negative impacts on the livelihoods of the thousands of mountainous people.

2.0 Materials and Methods

This report is prepared based on the best and latest available information on this species. The distribution of the Jatamansi was adopted from Herbarium deposited in National Herbarium and Plant Laboratory (KATH) and Tribhuvan University Central Herbarium (TUCH), Nepal as well as from various published literatures. The detail information on its availability and growing stocks were obtained by the government approved "District Forest Management Plan" and "Environment Impact Assessment Reports". The extracted information on distribution and its availability has been verified and cross-checked by triangulating with experts and senior officials of the District Plant Resource Offices under the Department of Plant Resources (DPR). Previous reports submitted to the CITES secretariat by Management Authority of Nepal were also reviewed.

All the mountainous districts with over the elevation of 3000 m asl are considered as the potential distribution areas of the Jatamansi. The jatamansi has been distributed in 27 districts and thus identified as the Jatamansi resource rich districts. Population status was taken from published literature, field visit report of DPR and five-year District Forest Management Plans(DFMP) of respective Division Forest Offices which has also reported the Annual Allowable Harvesting (AAH) quantity.

The inventory of the Jatamansi was done in district forest management plan by following the 'Non-Timber Forest Products Inventory Guideline 2012' (DoF, 2012). The trade status of the species was taken from CITES permit provided by Department of Forests and Soil Conservation, the Management authority of CITES for flora of Nepal.

3.0 Findings

3.1 Biological Data

3.1.1 Names and Family

Scientific name: *Nardostachys grandiflora* DC.,

Synonyms: *Nardostachysjatamansi*(D.Don) DC.

:*Nardostachyschinensis*Batalin(Catalogue of Life: 2018 Annual Checklist;Tropicos; Flora of China Vol. 19 Page 661).

Nepali name: Jatamansi, Bhulte

Figure 1: A owering Jatamansi Plant

English name : Spikenard, Musk root

Trade name : Jatamansi, Balchhad, Bhulte

Family : Caprifoliaceae

3.2 Distribution

Sino Himalayan, NW India, Sikkim, Bhutan, Myanmar, S & E Tibet, W China, throughout Nepal in between 3200-5000m asl.

This species is native to high mountainous regions. It is found widely distributed in high altitudinal region of Nepal, in 3200-5000 m **(**Press et al., 2000**).** The distribution of Jatamansi has been recorded from 27 mountainous districts of Nepal spread from the East to West. Various reports and publications described as the distribution of the species to be over 27 districts. Altogether 36 districts with an altitudinal ranges 3000 to 5000 m asl is considered as the potential area for Jatamansi in Nepal as shown in Figure 2. The distribution is higher and wider across the Western parts of Nepal.

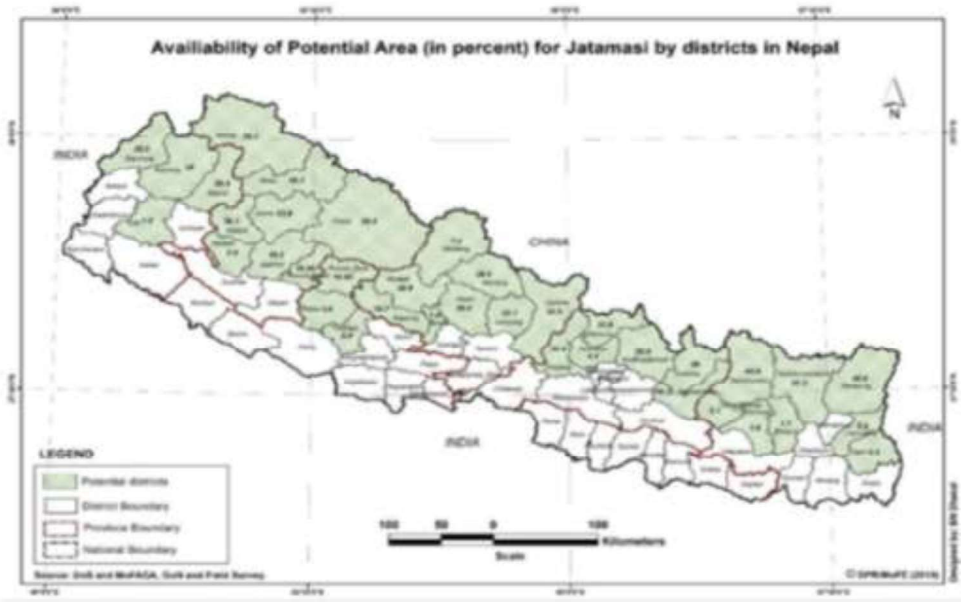

Figure 2: Potential districts for Jatamansi distribution in Nepal

Districts wise distribution of Jatamansi on the basis of herbarium

Herbarium specimens of Jatamansi from 21 districts are deposited in National Herbarium and Plant Laboratories (KATH) and Tribhuvan University Central Herbarium (TUCH). The specimens were collected from Bajhang, Darchula, Dolakha, Dolpa, Gorkha, Jumla, Kaski, Lamjung, Manang, Mugu, Mustang, Myagdi, Ramechhap, Rasuwa, Rukum, Sankhuwasaba, Solukhumbu, Taplejung, Sindhupalchok, Panchthar, Humla.

Districts wise distribution of Jatamansi on the basis of literature: 28districts

Western Nepal (15 districts): Jumla,Humla, Mugu,Bajhang, Bajura, Dolpa, Kalikot, Rukum East, Rukum West, Rolpa, Jajarkot, Dailekh, Doti, Pyuthan

Central Nepal (10 districts): Manang, Dhading,Lamjung, Gorkha, Sindhupalchok, Baglung, Myagdi, Ramechhap, Nuwakot, Rasuwa

Eastern Nepal (3 districts): Taplejung, Solukhumbu, Panchthar

3.3 Habitat

Rocky slopes, rock outcrops, meadows, shrub land and forests (Ghimire et al., 2008).

3.4 Biological characteristics

3.4.1 Morphology

Jatamansi is perennial, aromatic, herbaceous plant of 10-60 cm. height. Rhizome is short up to 12 cm long, dark grey, woody, thickened, and is covered with reddish brown, tufted, fibrous remains of the petioles of dead leaves (Fig 4).

Leaves: simple, rosette at base or opposite on stems, lanceolate, entire. Basal leaves linear to narrowly spathulate, (2.5-) 4-15 (-26) x 0.4-1.7 (-2.4) cm, glabrous or pilose on main veins and margin, cauline leaves narrowly ovate to ovate or oblong, 2-5.4 x 0.4-1.4cm, margin entire or serrulate.

Inflorescences: born, on terminal capitulum.

Flowers: light purple, campanulate. Flowering stems erect, 9-30 cm. Flower heads nearly 2cm in diameter. Calyx 5-lobed, 2-2.8 mm, entire or toothed. Corolla 5-lobed, unequal at base, tubular-campanulate, (4.5-) 5.5 x 13mm, pink to purple, hairy. Stamens 4.Fruit obovate, flattened, ca. 5 x 2.5 mm, 1-seeded.

Figure 3: Herbarium specimen of Nardostachys grandi ora deposited at KATH and its rhizome

Used/Trade Part:

- Dry rhizome

Weight of Rhizome

- Average dry biomass per ramet = 1.056 gram (DPR, 2017, unpublished)
- Average dry biomass per plant= 3 gram (DoF, 2017).

Oil Percentage

- 0.794 % - 1.54 % (NPRL, 2014; DPR, 2018)

3.4.2 Reproduction and Life Cycle

It is slow growing and long-lived species with seasonal growth. Its short growing season extends from May to early October. A single plant can have up to 21ramets in a dense cluster. Each ramet generally produces one, or in rare cases two to three inflorescences in June–July. An inflorescence can produce up to 25 seeds which mature in August-September. Seeds are passively dispersed in late September by wind, water or gravity, and germinate by May-June of the following year.

Seedlings grow into small rosettes during their first year. Their growth to reproductive size may take several years (Ghimire et al., 2008).Seed germination rates have been reported from 10-80% (Nautiyal et al., 2003; Regmi, 2000; Nautiyal and Nautiyal, 2004). A study from Dolpa, Nepal found the different survival rates of adults, juveniles and seedlings 88-100%, 68-90% and 46-78%, respectively (Ghimire et al., 2008). The growth of seedlings to

reproductive size may take 3-4 years (Nautiyal et al., 2003). Population growth rates are reported significantly higher in meadow habitat compared to rocky-outcrop due to differences in flowering frequency, seed mass, and seedling recruitment (Ghimire et al., 2008). Reproduction also takes place through rhizomes (Clonal growth).

3.5 Population Status

The population status of this species has been estimated by studying various published literatures and reviewing the approved District Forest Management Plans of resource rich districts. These approved DFMPs have done extensive Forest Inventory including that of major NTFPs covering *N. grandiflora* of respective district. The detail methods have been submitted in 30 November 2018 to CITES Secretariat by Department of Forests and Soil Conservation which is the Management Authority for flora in Nepal (DoFSC, 2018).

The population status such as the frequency, average density, productivity potential and distribution areas of the *N. grandiflora* have been studied by various authors and organizations (Ghimire et al, 1999; Shrestha and Shrestha, 2012; ANSAB, 2015; Chhetri and Gautam, 2015; DoF, 2017; DPR, 2017; DPR, 2018). The average frequency of the *N. grandiflora* is 14% varying from 0.9% (in Melchham, Humla) to 40% (Rasuwa). However, the field study done by DPR taking the sampling of 100mx100 m sizes in 2017 and 2018 showed much higher frequency that ranged from 86% (in Paplelekh, Gorkha) to 93.3% (in Dangdungedanda-Kopchevir, Sindhupalchowk) in Nepal (Table 1). Similarly the average density of the species reported to be 3 individual per square meter varying from 0.01 to 14.14 (Table1).

Table 1: The site specific population status of N. grandiflora reported by various study

SN	Location	District	Potential area (ha)	Density (ind./m2)	Frequency (%)	Productivity potential (Tons/year)	Reference
1.	Magri	Mugu	12,346	0.10	3.2	151.6	ANSAB, 2015
2.	Ruga	Mugu	6,511	0.04	5.4	33.2	ANSAB, 2015
3.	Darma	Humla	5,889	0.12	4.2	83.8	ANSAB, 2015
4.	**Melchham**	Humla	1,263	0.06	0.9	8.5	ANSAB, 2015
5.	Kharpu	Humla	9,716	0.08	10.3	89.0	ANSAB, 2015
6.	Haku	Jumla	19,030	0.01	9.1	33.2	ANSAB, 2015
7.	**Patarasi**	Jumla	10,972	0.45	14.2	595.5	ANSAB, 2015
8.	Ponger	Manang	3428	14.14	38.1	5307.6	Ghimire et al 1999
9.	Changle	Manang	711	3.06	13.3	294.3	Ghimire et al 1999
10.	Yumra	Manang	620	3.41	17.2	53.0	Ghimire et al 1999
11.	Manang		3338				DoF, 2017
12.	Rasuwa	Rasuwa	-	12.50	40.0		Shrestha and Shrestha, 2012
13.	Langtang NP	Rasuwa	-	0.71	12.7		Chhetri and Gautam. 2015
Total			**73,824**	**3 (avg)**	**14 (avg)**	**6649.6**	
1	Bhurichulalekh	Jumla		21.77	90.0	108kg/ha	DPR, 2018
2	Dyangdunge danda, Kopchevir	Sindhupalchok	-	28.56	93.3	516 kg/ha	DPR, 2017
3	Paplelekh	Gorkha	-	11.66	86.0	168 kg/ha	DPR, 2017
Average				**20.66**	**89.78**	**264 kg/ha**	

Division Forest Office (then District Forest Office) is the district level institution that regulates the local trade of Non-timber forest products in Nepal. A total of 84 DFOs are present in all 77 districts of Nepal that is mandated for the administration of forestry resources in their respective jurisdiction. Preparation of District Forest Management Plan (DFMP) is mandatory for each district, for sustainable harvesting of any forestry products including timber and non-timber, which should be approved by the Department of Forests and Soil Conservation, the Management Authority of CITES flora. Thus, the data from DFMP were extracted to review the population status of Jatamasi (Table-2).

The rotation period of the species has been kept 3 to 4 years based on the local conditions of the district. The district wise annual allowable harvest (AAH) have ranged from 0.539 tons (Rasuwa) dry rhizomes to 425 tons (Humla) as shown in Table 2. The collection and allowable harvest is lowest in Apinampa Conservation Area (Darchula district, west Nepal) which is administered by separate department called Department of National Parks and Wildlife Conservation (DNPWC). The total growing stock (TGS) is used here to describe total growth of *N. grandiflora* in its distribution area. The annual allowable harvest (AAH) is determined by different districts at the range of 10% (Humla district) to 55%(Bajura) with the median AAH of 30%. Rests of the rhizomes have been prescribed to remain in the ground to ensure its sustainable utilization. The rest parts of the rhizomes contribute in the natural regeneration and multiplications of the plants in following years after harvest. In most of districts the DFMP prescribed to collect up to 2/3 part of Rhizomes from the clumps to be harvested and 20% of total number of plants' clumps should be left untouched for seed production and regeneration that ensures sustainability of resources (DoFSC, unpublished).

On the basis of District Management Plan (DFMP) of following districts and EIA Report approved from Government of Nepal (Ministry of Forests and Environment), Annual Allowable Harvesting (AAH), Rotation period for collection followed in respective district (RP), are presented in Table 2:

Table 2: AAH of *N. grandi ora* and rota on period from various districts

S.N.	Name of District	AAH (dry weight in MT) .	Rotation Period (year)	Environment Studies (Approved)	Remarks
a. Jurisdiction of Department of Forests and Soil Conservation					
Western Region of Nepal					
1.	Jumla	50.0	3	IEE	DFMP, 2013
2.	Humla	425.0	4	EIA	EIA Report 2018
3.	Mugu	48.6	3	IEE	DFMP, 2015
4.	Bajhang	47.0		IEE	

5.	Bajura	42.6	3	IEE	DFMP, 2014
6.	Dolpa	44.4*	3	IEE	DFMP, 2018
7.	Kalikot	49.5*	3	IEE	DFMP, 2018
8.	Rukum East	22.0	-	IEE	DFMP, 2017
9.	Rukum West	8.0	-	IEE	DFMP, 2017
10.	Rolpa	20.5	3	IEE	DFMP, 2015
11.	Jajarkot	30.7*	3	IEE	DFMP, 2018
12.	Dailekh	49.7	-	IEE	DFMP, 2018
13.	Doti	5.0		IEE	
14.	Pyuthan	3.0	-	IEE	DFMP, 2014
Central Region of Nepal					
15.	Manang	18.2	-	IEE	DFMP, 2018
16.	Baglung	1.7	3	IEE	DFMP, 2014
17.	Myagdi	1.1	3	IEE	DFMP, 2018
18.	Lamjung	20.2	3	IEE	DFMP, 2018
19.	Gorkha	4.9	-	IEE	DFMP, 2014
20.	Dhading	2.0	-	IEE	DFMP, 2018
21.	Nuwakot	1.0	-	IEE	DFMP, 2014
22.	Rasuwa	0.7	-	IEE	DFMP, 2017
23.	Sindhupalchok	2.3	-	IEE	DFMP, 2017
24.	Ramechhap	1.5	-	IEE	DFMP, 2017
Eastern Region of Nepal					
25.	Taplejung	25.5	3	IEE	DFMP, 2017
26.	Solukhumbu	1.2	-	IEE	DFMP, 2015
b.Jurisdictions of Department of National Parks and Wildlife Conservation					
1.	Api NampaConservation Area, Darchula	1.7	-	IEE	MP (2015-2019)
2.	Shey Phoksundo NP, Dolpa	50.0		IEE	
Total		978			

Note: DFMP: District Forest Management Plan of respective districts and MP: Management Plan of Conservation Area; IEE: Initial Environment Examination; EIA: Environment Impact Assessment, report approved by Ministry of Forests and Environment; EMP: Environment Management Plan; MT: Metric Ton. *AAH increased after new DFMP approval from earlier submission to CITES (DoFSC, 2018)

Table 2 shows that, the total AAH is 978 M. ton which has been increased from 935 M. ton as prescribed in (2018) earlier report submission to CITES Secretariat. This increament in AAH is because of the strong restriction for collection of the species since 2017.

3.6 Conservation Status and Threats

A. Conservation Status

The conservation status of *N. grandiflora* has assessed by different organization and scientific studies based on different criteria and indicators. It is rated from vulnerable to critically endangered as shown in Table 3:

Table 3: Conserva on status of *N. grandi ora*

IUCN, 2014	CAMP 2001	Shrestha & Joshi, 1996	Shrestha & Shrestha 2012(LNP)	Lama et al., 2001 (Dolpa)
Critically Endangered	Vulnerable	Vulnerable	Most Vulnerable category	Highly Vulnerable

*3.6.1 **Global Status***

According to IUCN assessment at the global scale in 2014, *N. grandiflora* was assessed to be Critically Endangered.

*3.6.2 **National Status***

N. grandiflora was assessed to be vulnerable at a CAMP workshop in Nepal in 2001 (Anon, 2001). According to Shrestha and Joshi 1996, *N. grandiflora* is vulnerable.

*3.6.3 **Local Status***

- According to Lama et al 2001, Local status of *N. grandiflora* in Dolpa is highly vulnerable. Threat on this species is due to over harvesting for trade.
- *N. grandiflora* is considered as highly threatened plants in Lower Kanchenjungha Singhalila Ridge,
- According to Shrestha & Shrestha in 2012, rapid vulnerability assessment of high-valued medicinal plants in Langtang National Park (LNP) has placed *N.grandiflora* in the most vulnerable category of species. The vulnerability of these species is mainly due to high trade demand, high collection pressure and unsustainable harvesting methods. Other natural causes of their vulnerability are specific habitat preferences.

B. Conservation Threats

Major threat to *N. grandiflora* in Nepal is anthropogenic. People from the mountain and the Himalaya are unaware about its global significance and reproduction system. Unsustainable harvesting for the trade purposes is considered as the key threat (Larsen and Olsen, 2013). Forest fragmentations, habitat degradation, inadequate investment in the management of the species are the major constraints leading to the threats for the species conservation. In some places, the over exploitation and immature harvesting of the species due to its several

medicinal properties and high demand from the pharmaceutical industries are considered as important threats (Singh et al. 2013). Habitat loss is continued due to infrastructure construction, agricultural expansion and human settlements in particular areas. The Government of Nepal has implemented various measures for effectively reduce the threats and ensure sustainable conservation. It has banned the export of the species in the raw form since 2000 AD. It has completely banned the collection, domestic transport and export of the Jatamansi since May 2017. This ban has, though negative impacts on the livelihoods of poor mountainous people, has increased its growing stock. As Nepal has implemented the devolved paradigm of forest management through very successful community forestry programs, the stewardship of the forests and its resources including all MAPs (and Jatamansi) has positive impacts to alter the conservation threats and restore the loss.

The overall threat level of the species in Nepal has been assessed by plotting the radar graph based on the 26 different factors that affects the management of the harvesting of the Jatamansi. Same factors were used in drawing the graph which is suggested by CITES NDF Checklist (Appendix 2).

Radar chart summarizing the non-detriment finding assessment under taken for *N. grandiflora*in accordance with the CITES NDF checklist. Explanations of scores given are detailed in appendix 2. Lower scores are indicative of lower risks to the species. There is not 4 and 5 scores in any of factors suggested in the CITES NDF Checklist. The shaded area closer to the center in the radar chart demonstrates an overall low to medium risk to the species(Figure 4). The propose harvest and management plans are likely to be non-detrimental, most of the answers fall in the precautionary areas of appendix- 2,and will be depicted near the center of the circle.

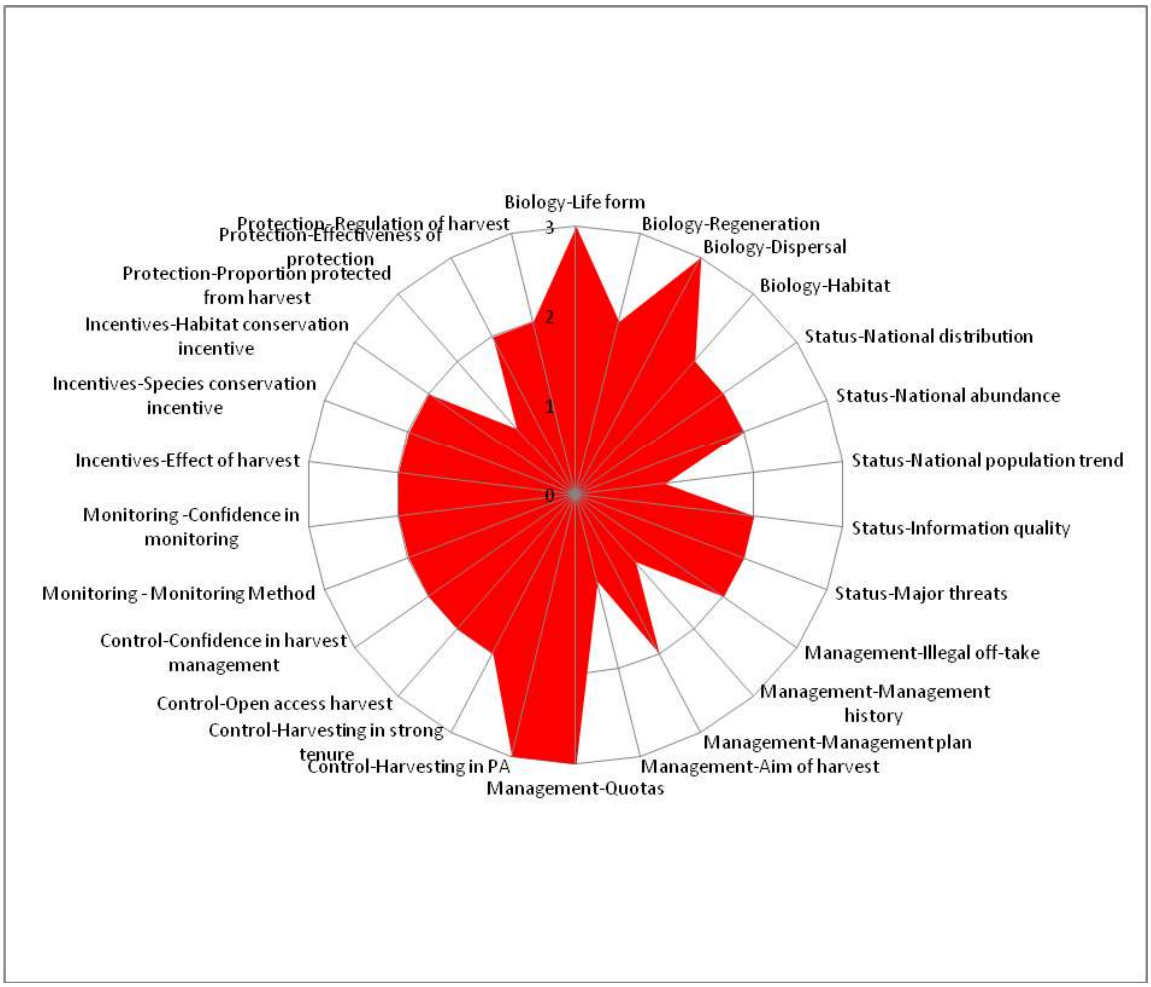

Figure 4: Radar graph depic ng the non-detrimental management plans of *N. grandi ora* in Nepal

The limited shaded area in the radar chart demonstrates an overall low risk to the species. It indicates that the species is at low risk and trade is not detrimental

4.0 Management of the species

There are different management practices in Nepal for the overall management of the forestry resource. The Forest Acts 1993 and its Regulations 1995 have mandated the Divisional Forest Officers to hand over the national forests to adjoining people for its conservation, management and utilization. A total of 2.24 million hectare of national forests has already been handed over to 2.9 million families of 22,266 Community Forest User Groups (DoFSC, 2017). Most of the *N. grandiflora* habitat of high mountainous regions has been handed over to local community for the conservation, utilization and management. The local community has taken the stewardship and been effective for restoring the degraded lands and reducing deforestation.

The Ministry of Forests and Soil Conservation has prepared and approved conservation and action plans for five different plant species namely i) Bijaysal (*Pterocarpus marsupium*),

Rhododendron (Rhododendron spp.), Okhar (*Juglans regia*), Champ (*Michelia* spp) and Rosewood *(Dalbergia latifolia*). The Department of Plant Resources is going to prepare the Conservation and Action Plan for Jatamansi (*N. grandiflora*) in this fiscal year. That will provide various prescriptions about sustainable utilization and conservation of the Jatamansi; and also ensure the budgetary allocation for the implementation of the plan.

The Government of Nepal has promulgated adequate legislation for the conservation, management and utilization of the timber and non-timber forest products including Jatamansi. The major legislations are as follows:

Forest Act, 1993 and the Forest Regulations, 1995:

Regulate the trade and harvesting of Medicinal plant from forests in Nepal. It has made mandatory to prepare the District Forest Management Plan and estimatespecies wise AAH providing due conservation priorities to harvest any forest products. None of forest products can be harvested more that approved AAH.

Export of *N. grandiflora* was banned in 1995 as specified in the Forest Regulation. Its amendment in 2001 allowed export of processed plant material with the scientific recommendation of the Department of Plant Resources and permission ofDepartment of Forests and Soil Conservations.

Environment Protection Acts 1996 and Environment Protection Regulations, 1997 (amendment):

Annual extraction from 5 to 50 metric tons of roots/rhizomes from each district requires IEE and over 50 tons requires EIA study.

National Parks and WildlifeConservation Act (1973):

The goals of this act are to protect and manage wildlife and habitats throughout Nepal. This act prohibits entry inside national parks and wildlife reserves without permission from an authorized officer. Permission is required to collect any NTPs' specimen from Protected Areas and its Buffer zone. This Acts are more conservation focused than such others in Nepal. Two Protected Areas namely Apinampa Conservation Area (Darchula) and Shey-Phokshundo National Park (Dolpa) have provisions in their management plan for the collections and trade of *N. grandiflora* in Nepal found.

Control of International Trade of Endangered Wild Fauna and Flora Act (CITES), 2017:

For the implementation of Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973, an Act is enacted which is cited as "Control of International Trade of Endangered Wild Fauna and Flora Act, 2017."This Act comes into enforcement throughout Nepal. The Act has been the major instruments for regulating trade of CITES Appendices species including Jatamansi which is in its Appendix II. All activities from collection to export permit of the CITES listed species needs to get permission from its

Management Authority (DoFSC) at the recommendation of Scientific Authority (DPR) in Nepal. That provision further makes the conservation of Jatamansi more effective.

CITES Export permit process

- **AAH in DFMP:** Provision on District Level Five Year Management Plan to quantify the annual harvestable amount of Jatamansi.
- **Collection Permit:** Collection permit either from the District Forest Office (DFO) in Government managed Forest or from Community Forest User Group (CFUG) in Community Forest is required for Harvesting. An application should state the type of Non timber forest products (NTFPs), the area, the quantity and purpose of collection.
- **Royalty Payment:** According to the article 8(3) of forest regulation 1995, Royalty as mentioned in the Forest regulation should be paid before getting the collection permit.
- **Checking and Weighing:** After harvesting the Products, the respective forest office (DFO/Illaka) or CFUG shall check and weigh to tally the amount of Jatamansi collected against the licensed amount.
- **Release order or transport permit**: For the sale, transport and distribution collected in the district, a release order must be obtained from the DFO. The Release order is valid for 15 days but can be extended for seven more days at a time.
- **Checking and endorsement:** The Forest officials check the amount and material as the release order and endorsed it with district sealing stamp in sack or Vehicle.
- **Storing:** The traders store the raw material near the processing plant.
- **Processing and Measurement of extracts:** Extraction of oil and marc from the Production unit
- **Application for CITES Export Permit to DoFSC:** A formal application should be given to DoFSC including release order, Quantity of Extracted oil marc description, Purchase order from importer company/country.
- **Verification/ Certification**: For the verification, DoFSC send the sample to Department of Plant Resources (DPR), Scientific Authority of CITES Plant. DPR provides product test and certification service for processed extracts and send it to DoF.
- DoFSC issues the export permits (stamps) for the Applicants through Concerned DFO for export.

4.1 Promotion for Cultivation

Nardostachys grandiflora is prioritized by Government of Nepal for research and economic development among 33 medicinal and aromatic plants (DPR, 2017). It is also a major species among 13 prioritized NWFP species by Government of Nepal for Agro-technology development among in country. Recently, the DPR and DoFSC have been promoting cultivation of the species through providing financial subsidy for the cultivation of Medicinal Plants including Jatamansi (DPR, 2019; DoFSC, 2019 unpublished reports).

4.2 Monitoring

The Ministry of Forests and Environment regular conducts several monitoring missions for the overall performance of resource harvesting and its trade. The central Department of

Forests and Soil Conservation, DPR and provincial governments do also perform regular monitoring of the collection, local processing and trade related activities. According to recent Constitution of Nepal, rural municipality which is the local level government in Nepal, do regular monitoring of the species in their jurisdiction

In Nepal, the third-party monitor whether the trade is legal or illegal. Security personnel, customs officials, local government representatives follow the proper procedures to allow transportation and cross boarder pass based on only permitted species and amounts are collected and transported. The constitutional body, Commission for the Investigation of Abuse of Authority (CIAA; www.ciaa.gov.np), and National Vigilance Center (NVC; www.nvc.gov.np) directly under the control of Prime Minister of Nepal, also do regular monitoring and take actions against any mis-appropriation.

DPR also collect information about the trade of NTFPfrom custom office and compare data provided from Department of Forest. DPR has published and disseminated the books related to Traded CITES plants including photographs in Nepali language so that it will help for the identification.

5.0 Trade Status

5.1 Domestic Use and Trade

The *N. grandiflora* is a very valuable NWFP resource for the Mountainous regions of Nepal. More than 25,000 families are estimated to be involved in the collections and trade of Jatamansi for their livelihoods, as majority of the income comes from it. According to expert survey and consultation with local entrepreneurs, a total of 20-30% of the Jatamansi raw materials is estimated to be used in the domestic markets. The Jatamansi derivatives have been used in Ayurveda and aroma therapy in Nepal. In addition, the Jatamansi marc have been sold in the market for producing incense sticks.

5.2 International Trade

Nepal has prioritized MAPs as one of the major commodities out of major 19 products of our competitive advantage for potential export sector (GoN/MoC, 2016). Nepal has been exporting various MAPs including Jatamansi for time immemorial. There are several specific legislations and policies government has made for the facilitation of the international trade of Jatamansi and regulating overexploitation.

The Forest Regulations of Nepal, 1995 has banned the export of Jatamansi in the raw forms since 2001. Any unprocessed rhizomes are not allowed to export from Nepal. There were very less quantities of processed derivatives of Jatamansi (e.g. marc, oil) export in early period (2008-2012) in comparison of later period (2013-2017) as shown in Figure 5.The average annual export of Jatamansi marc was about four times higher (i.e. 253.8 tons) in later period (2013-2017) as shown in Figure 5. This trend remains the similar in the case of Jatamansi oil (Table 5).This is due to lack of the processing units and industries in the early period in Nepal. There are several industries and investment in the later period to establish NTFPs processing units including that for Jatamansi. That increase is directly linked to the growth of Jatamansi derivatives export in the later period (2013-2017).

Three main markets for Jatamansi marcs are India, Pakistan and Bangladesh whereas it was India, USA and Belgium for the oil (Table 4).Total export quantities of the Marc and oil and their destination have been given in Table 4.

The Department of Forests (then) did not allow any export permit since May, 2017. In the absence of CITES Regulation, there did not occur any export of the Jatamansi Marc and oil even after promulgation of the CITES Act, 2017.

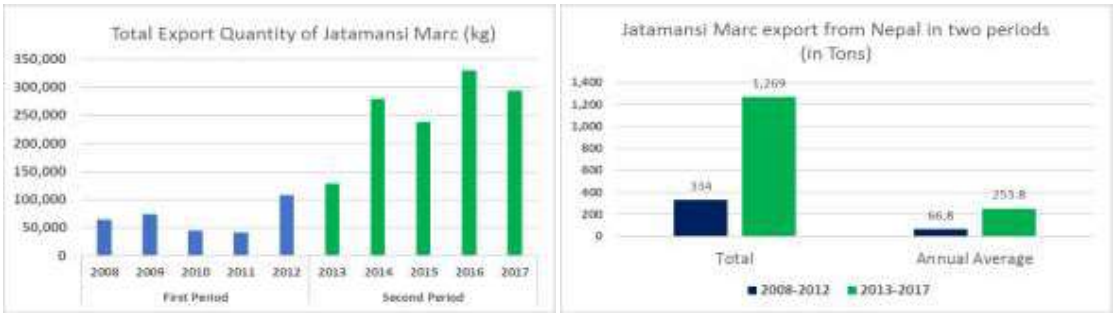

Figure 5: Annual export quan ty of Jatamansi Marcs (le) and the average annual export for two di erent periods

Table 4:Export quan ty of N. grandi ora Marc (kg) in di erent countries

Country	Year											Total
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
India	40,453	7,350	9,856	19,250	39,901	10,3928	211,622	193,347	226,159	210,433	0	1062,299
Pakistan	24,048	67,048	35,170	22,307	68,719	24,507	64,400	44,610	97,740	83,264	0	531,813
Bangladesh	0	0	0	0	0	0	2,850	0	6,360	0	0	9,210
Total	**64,501**	**74,398**	**45,026**	**41,557**	**108,620**	**128,435**	**278,872**	**237,957**	**330,259**	**293,697**	**0**	**1,603,322**
Average	**160,332.2 Kg = 160. 3322 M ton**											

Source: DoFSC, CITES Export Permits records 2008-2018

Table 5: Export quan ty of N. grandi ora Oil (kg) in di erent countries

Country	**Year**										**Total**
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	
India	51	51	524	866	833	2,404	3,117	2,651	4,057	3946	**18,500**
Pakistan	0	0	135	0	30	0	0	0	0	0	**165**
USA	0	0	0	0	5	25	135	10	1,486	818	**2,479**
France	10	0	5	28	71	0	84	95	0	50	**343**
Belgium	159.5	0	0	53.6	99.7	0	20	216.5	404	0	**953**
UK	0	0	49	49	0	0	10	168	25	0	301
Switzerland	0	0	0	0	0	180	100	0	0	0	280
Germany	0	0	0	0	0	0	40	20	0	10	**70**
UAE	0	0	0	0	0	0	50	0	0	0	50
South Korea	0	0	0	0	0	0	0	3	1	0	4
Total	**220.5**	**51**	**713**	**996.6**	**1,038.7**	**2,609**	**3,556**	**3163.5**	**5,973**	**4824**	**23,145.3**
Average	**23,14.5 Kg per year**										

Source: DoFSC, CITES Export Permits records 2008-2018

The average oil percentage from above data was about 1.44%. According to Natural Product Research Laboratory report, 2014 the oil percentage of Jatamansii varies from 0.794% to 1.54%.Thus the dry weight of traded rhizome will be 162.4422 M ton per year. The data shows that the trade quantity is increasing. This can be expected that the demand of marc and oil in international market is increasing.

6.0 Sustainable Harvesting

The Government of Nepal is very sensitive and committed for the conservation of all NWFPs including Jatamansi. It has provisioned various legal measures as described in section 4.0.

The DoFSC and respective DFOs regularly organize the monitoring mission that is to regulate the premature and over harvesting, illegal collection and trade etc. The rotational harvesting of the Jatamansi at the interval of 3 to 4 years has been in practice. This interval of 3 to 4 years allows the species to restore (Nautiyal et al., 2003). Further the annual allowable harvestable quantity (AAH) of *N. jatamansi*is prescribed up to 55% of the total growing stockthat may varies from 10% to 55 % of the total growing stock based on local biophysical conditions of different district to ensure the sustainability of the valuable resources. According to Ghimire et al., 2008, the size of outcrop populations would return to initial values within 5 years, only after 10% rhizome harvesting. While 25% harvesting take 17 years and 75% harvesting take 33 years to return to initial value. Whereas in Meadow, population (with harvesting levels >25%), projected recovery time was 6 years. Thus 10 % harvesting in five-year rotation period by making different block in one district could be considered as sustainable.

7.0 Precautionary Quota

In Nepal Jatamansi had been collected annually from very early period on the basis of AAH mentioned in the district management plan. The trade data shows that there is annually increment in quantity which indicate that the species in Nepal is found abundantly. Thus the collection of this species in Nepal had not affect in its overall population though in some area it is found vulnerable.Nepal is a mountainous country. 35% of its total land area is covered by high mountains which are the potential area of jatamansi. The people living in this regionsrely on the collection of wild medicinal plants including Jatamansi for subsistence livelihood who are mostly deprived, underprivileged and marginalized community. Because of the harsh climatic condition, very limited cultivated land the opportunities of income diversification are very low in this region. The ban in the collection, processing and trade of Jatamansi largely jeopardize and narrow down the livelihood opportunities of rural people. Thus on the scientific basis, precautionary quota could be provided to harmonise the livelihood of local people with the conservation of this species.This quota could be increased or decreased after three to five years with the revised study of its population status.

The precautionary quota can be calculated by taking only 10% of the total growing stock (TGS) of each available district with the rotation period (RP) of 5 years as follows.(Table 6)

$$\text{Precautionary quota} = \frac{10\% \text{ of Total Growing Stock}}{\text{Rotation Period (Year)}}$$

Precautionary quota of each jatamansi available district were calculated by using the above formula. It ranges from 0.02 MT in Nuwakot district to 340 MT in Humla. Humla is the second largest district in terms of area 5655 sq. km or 5,65,500 ha or five percent of total land of Nepal. The district is on Northern part of Himalayas adjoining to Tibet region of China. So, the district has large area of high altitude regions, which are home of high altitude herbs like Jatamansi (*Nardostachys grandiflora*) and have **46,338 ha** area covered with Jatamansi and also estimating the productivity potential as 281kg/ha-525 kg/ha. (EIA Humla, 2017)

Table 6: Precautionary quota of respective districts:

S.N.	Name of District	TGS (MT)	Rotation Period (year)	Precautionary quota for each district. (MT)
1.	Jumla	150.0	5	3.0
2.	Humla	17000.0	5	340.0
3.	Mugu	223.2	5	4.5
4.	Bajhang	47.8	5	3.2
5.	Bajura	158.1	5	11.9
6.	Dolpa	440.0	5	0.94
7.	Kalikot	594.2	5	8.8
8.	Rukum East	22.0	5	0.55
9.	Rukum West	8.0	5	0.16
10.	Rolpa	20.5	5	0.41
11.	Jajarkot	306.7	5	6.134
12.	Dailekh	49.736	5	1.0

13.	Doti	5.0	5	0.1
14.	Pyuthan	3.0	5	0.06
15.	Manang	36.5	5	0.73
16.	Baglung	5.625	5	0.1125
17	Myagdi	5.7	5	0.114
18.	Lamjung	27.8	5	0.56
19.	Gorkha	4.9	5	0.098
20.	Dhading	2.0	5	0.04
21.	Nuwakot	1.0	5	0.02
22.	Rasuwa	9.62	5	0.2
23.	Sindhupalchok	2.25	5	0.05
24.	Ramechhap	1.5	5	0.03
25.	Taplejung	25.0	5	0.5
26.	Solukhumbu	1.2	5	0.024
27.	Api NampaConservation Area, Darchula	1.7	5	0.034
28.	Shey Phoksundo NP, Dolpa (Buffer Zone)	50.0	5	1.0
Total				382.7

Table 6 shows that the total precautionary quota is 382.7 M.Ton/year. Thus 382.7 M.Ton is considered as the precautionary quota for 2019.

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National Herbarium and Plant Laboratories.www.kath.gov.np

Non-detriment finding assessment for *Nardostachys grandiflora* undertaken in accordance with the CITES NDF checklist.

Appendix 1: (Summary of harvest regime for plant species)

Species: . *Nardostachys grandiflora.* . . . . . .
. Country (if applicable state or province): .Nepal .

Date (of making non-detriment finding): September 2019

Period to be covered by finding: 5 years

Name: Madhu Devi Ghimire/Kalpana Sharma Dhakal

Position in Scientific Authority: Scientific officer/ Asst. Scientific officer.

Is the species endemic, found in a few countries only, or widespread? Found in few countries. like India, Bhutan, China. . .

Conservation status of the species (if known):

IUCN Global status: Critically Endangered

National status: Vulnerable. .

Type of harvest	Main Product	Degree of control	Demographic segment of population harvested	Relative level of harvest (include number or quantity if known)	Reason for harvest and percentage (if known)	Commercial destination and percentage (if known)
1.3 Non-lethal harvesting of roots	Ayurbedic medicine, incense stick, perfumed ointment, Marc and oil.	a)Regulated	a)Immature, b)Mature	Medium	a) subsistence purpose. b) commercial (10% - 55%)	a)Local, b)International Marc: 293,697 Kg in 2017 oil: 4824 Kg

Appendix 2: Factors for evaluation threats based on CITES: Scores assigned to each question are highlighted along with detailed explanations/justifications where relevant. Higher scores are indicative ofhigher risks to the species.

Biological characteristics		
1. Life form: What is the life form of the species?	Annual	1
	Biennial	2
	Perennial (herbs)	3
	Shrub and small trees	4
	Trees	5
2.Regeneration potential: What is the regenerative potential of the species concerned	Fast vegetatively	1
	Slow vegetatively	2
	Fast from seeds	3
	Slow or irregular from seeds or spores	4
	Uncertain	5
N. grandiflora is slow growing long-lived species that regenerate from seed as well as from rhizome. Seed germinate rate varies from 10%-80%. The growth of seedlings to reproductive size may take 3-4 years. The survival rates of adults tobe high (88-100%), while lower for juveniles and seedlings (68-90%and 46-78%, respectively).It is characterized by vegetative growth through the multiplication of basic module, the ramet which grows into a dense clump, in which the successive ramets are produced very close together.		
3. Dispersal efficiency: How efficient is the species dispersal mechanism?	Very good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5
Seeds are passively dispersed in late Septemberby wind, water or gravity.		
4. Habitat: What is the habitat preference of the species?	Disturbed open	1
	Undisturbed open	2
	Pioneer	3
	Disturbed forest	4
	Climax	5
It is a alpine perennial herb found only in himalayas. It has been reported on from rockyslopes, rock outcrops, meadows, shrublands and forests at 3200m-5000m asl.		
National status		
5. National distribution: How is the species distributed nationally	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localized	4
	Uncertain	5
The distribution of Jatamansi according to Management Plan from different district has been recorded from 27 mountainous districts of Nepal spread from the East to West. Various reports and publications described as the distribution of the species to be over 27 districts. As 36 districts are located at the altitudinal ranges of 3000 to 5000 m asl which is considered as the potential area for Jatamansi in Nepal .The distribution is higher and		

wider across the Western parts of Nepal.		
6. National abundance: What is the abundance nationally	Very abundant	1
	Common	2
	Uncommon	3
	Rare	4
	Uncertain	5
The average frequency of the *N. grandiflora* is 14% varying from 0.9% (in Melchham, Humla) to 40% (in Rasuwa, Rasuwa). However, the field study done by DPR taking the sampling of 100mx100 m sizes in 2017 and 2018 showed much higher frequency that ranged from 86% (in Paplelekh, Gorkha) to 93.3% (in Dangdungedanda-Kopchevir, Sindhupalchowk) in Nepal. This shows that abundance in some area is Very abundant and in some area it is rare. Thus National abundance is considered as uncommon.		
7. National population trend: What is the recent national population	Increasing	1
	Stable	2
	Reduced, but stable	3
	Reduced and still decreasing	4
	Uncertain	5
The trade data of last 10 year shows that the trade amount is increasing. All the amount was collected from wild in rotation period. According to local perception, recently the population is reduced as they have to travel more distance for collection than 5 years ago. But the trade amount is not decreased. Thus the national population is Increasing.		
8. Quality of information: What type of information is available to describe abundance and trend in the national population?	Quantitative data, recent	1
	Good local knowledge	2
	Quantitative data, outdated	3
	Anecdotal information	4
	None	5
Most of the data were extracted from secondary literature which is completed in 2013-2018 and also from the local perception.		
9. Major threats: What major threat is the species facing (Underline following: overuse/habitat loss and alteration/ invasive species/other :) and how severe is it?	None	1
	Limited/Reversible	2
	Substantial	3
	Severe/Irreversible	4
	Uncertain	5
Overharvesting of the species for the commercial purposes is main threat. Forest fragmentations, habitatdegradationare the major constraints leading to the threats for the species conservation. In some places, the over exploitation and immature harvesting of the species due to its several medicinal properties and high demand from the pharmaceutical industries are considered as important threats. Habitat loss due to road construction, agricultural invasion and human settlements in very few particular areas.		
Harvest management		
10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	None	1
	Small	2
	Medium	3
	Large	4
	Uncertain	5
Illegal trade is insignificant. The collection is done on the basis of permit provided from		

Division Forest Office (Former District Forest Office).		
11. Management history: What is the history of harvest	Managed harvest: Ongoing with adaptive framework	1
	Managed harvest: Ongoing but informal	2
	Managed harvest: new	3
	Unmanaged harvest: ongoing or new	4
	Uncertain	5
The trade and harvesting of Medicinal plants from forests in Nepal were regulated and managed since the promulgation of Forest Act,1993 and the Forest Regulations, 1995. It has made mandatory to prepare the District Forest Management Plan and estimatespecies wise AAH providing due conservation priorities to harvest any forest products. None of forest products can be harvested more than that approved AAH. Harvesting in rotation period, giving permission to collect the species after seed maturation season and prescribing to collect up to 2/3 part of Rhizomes from the clumps to be harvested and 20% of total number of plants' clumps should be left untouched for seed production are some of the adaptive measure mention in DFMP.		
12. Management plan or equivalent: Is there a management plan related to the harvest of species?	Approved and coordinated local and national management plans	1
	Approved national/state/provincial management plan	2
	Approved local management plan	3
	No approved plan: informal unplanned management	4
	Uncertain	5
For each district there is management plan of Forest as well as protected areas. This management plan include the quantity of harvesting amount of each species found in the forest and also recommend the harvesting season, way to sustainable harvest and approved by Department of Forests and Soil conservation.		
13. Aim of harvest regime in management planning: What is harvest aiming to achieve?	Generate conservation benefit	1
	Population management /control	2
	Maximize economic yield	3
	Opportunistic, unselective harvest, or none	4
	Uncertain	5
14. Quotas: Is the harvest based on a system of quotas	Ongoing national quota: based on bilogically derived local quotas	1
	Ongoing quotas: cautious national or local	2
	Untried quota: recent and based on biologically derived local quotas	3
	Market-driven quota(s), arbitrary quota (s), or no quotas	4
	Uncertain	5
On the basis of Demographic variation and population viability studied on Nardostachys grandiflora, recently the quota is suggested for each district but not tried.		
Control of harvest		

15. Harvesting in Protected Areas: What percentage of the legal national harvest occurs in State-controlled Protected Areas	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
In Nepal there are 20 protected areas which include 12 National Parks, one hunting reserve, one wild life reserve and six conservation areas. Harvesting in National Parks is allowed only for house hold purpose after taking the legal permission. While in conservation area, prescribed quantity in their management plan is allowed to harvest for other than household purpose also.Thus very low quantity is harvested from protected areas.		
16. Harvesting in areas with strong resource tenure or ownership: What percentage of the legal national harvest occurs outside protected areas, in areas with strong local control over resource use?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
The Forest Acts 1993 and its Regulations 1995 have mandated the Divisional Forest Officers to hand over the national forests to adjoining people for its conservation, management and utilization. A total of 2.24 million hectare of national forests has already been handed over to 2.9 million families of 22,266 Community Forest User Groups (DoFSC, 2017). Most of the *N. grandiflora* habitat of high mountainous regions has been handed over to local community for the conservation, utilization and management.		
17. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving de facto or actual open access?	None	1
	Low	2
	Medium	3
	High	4
	Uncertain	5
18. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Due to insufficient budget and trained human resource, it is difficult for effective implementation of management plan and harvest control.		
Monitoring of harvest		
19. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest?	Direct population estimates	1
	Quantitative indices	2
	Qualitative indices	3
	National monitoring of exports	4
	No monitoring or uncertain	5
20. Confidence in harvest monitoring: Do budgetary and other factors allow effective harvest monitoring?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4

	Uncertain	5
It is difficult to monitor the direct population estimates of the harvested population due to its biological characteristics. DPR, Scientific authority of CITES plant is monitoring through the export permit, collection permit and collecting local knowledgeas well as studying population status of the species.		
Incentives and benefits from harvesting		
21. Utilization compared to other threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species?	Beneficial	1
	Neutral	2
	Harmful	3
	Highly negative	4
	Uncertain	5
22. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
23. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
Protection from harvest		
24. Proportion strictly protected: What percentage of the species natural range or population is legally excluded from harvest?	> 15%	1
	5-15	2
	< 5%	3
	None	4
	Uncertain	5
10% to 55% of total growing stock is only allowed for harvesting. Five National Parks (core areas) in Nepal which lie in high mountain strictly prohibit the plant from collection.		
25. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Nepalese Army personnel stationed in the National parks contribute to the strict protection of the species in protected areas as well as permit system to collect from outside the protected area are the effective measures of strict protection of the species in Nepal.		
26. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse?	Very effective	1
	Effective	2
	Ineffective	3
	None	4
	Uncertain	5
Collection permit is provided only after flowering and fruiting season at the month of October- November.		

Appendix 3

List of Participants

1. Mr. Dhananjaya Paudyal, Director General, Department of Plant Resources
2. Mr. Rajendra KC, Deputy Director General, Department of Forest and Soil Conservation
3. Ms. Jyoti Joshi, Deputy Director General, Department of Plant Resources
4. Mr. Mohan Dev Joshi, Deputy Director General, Department of Plant Resources
5. Ms. Madhu Devi Ghimre, Scientific Officer, Department of Plant Resources
6. Ms. Sangeeta Swar, Scientific Officer, Department of Plant Resources
7. Ms. Kalpana Sharma Dhakal, Assistant Scientific Officer, Department of Plant Resources