



Proceedings of the
Sixth International Conference on
National Development: Challenges and
Opportunities for the Diaspora
(March 22, 2014)



Nepalese Student Association

New Mexico State University
Las Cruces, NM 88003



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Editor's Note

The annual international conference of the Nepalese Student Association at New Mexico State University provides a public forum for exchange of ideas and challenges pertaining to diaspora.

This publication contains articles presented at the 6th international conference with the theme 'National Development: Opportunities and Challenges for the Diaspora' held on March 22, 2014. We hope you will find the papers presented herein valuable and inspirational for future reflection and initiatives.

Please note that papers contained in this volume appear exactly as submitted by the author(s) for the proceedings of the Sixth International Conference of NeSA NMSU, 2014 and have not been subject to editing.

Editor

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Voice Against Cancer Representative (NMSU), Reducing Cancer Burden Globally: An Initiative of NMSU Voice Against Cancer Organization

Urendra, Julio (NMSU), Algorithmic Aspects of the Embedding Problem

Paudel, Lokendra (NMSU), Kronecker Function Rings of Ring Extensions

Sixth International Conference on
**National Development: Opportunities and Challenges
for the Diaspora**

Nepalese Student Association

New Mexico State University

Las Cruces, NM

(Saturday, March 22, 2014)

8:00 – 9:00	Registration
9:00 – 09:40	Opening Session
9:00 – 9:10	Preparation and Proceeding to Conference Hall
9:10 – 9:25	Inaugural Speech by Graduate School Interim Dean, Dr. Loui Reyes
9:25 – 9:35	Welcome speech by NeSA Advisor, Dr. Ram N Acharya
9:35 – 9:40	Welcome speech by NeSA President, Rishi Sapkota
09:40 – 12:00	(Session I) Morning Session (Health, Education, and Academics)
09:40-10:00	Sanjay Timilsina , (UTEP). Comparative Structural Analysis of Phospholipase A2 and Combinatorial Screening of PLA2 Inhibitors
10:00-10:20	Valeria Aguirre Holguin , (NMSU). The Pivotal Role of Mathematical Definitions in the Constructions of Proofs
10:20-10:40	Sarvesh Dip Dhakal , (UTEP). Moisture Susceptibility of Asphalt Concrete
10:40-11:00	Bishnu H. Dhakal, Rajesh K. Patti, James W. Herndon (NMSU). Study of the 1, 7-hydride Shift in the Preparation of alkylidenephthalans through the Coupling of Fischer carbene Complexes with o-alkynyl carbonyl System
11:00-11:20	Zheng Wei , (NMSU). How to Explain the Definition of Stochastic Affiliation to Economics

- 11:20-11:40 **Rishi Sapkota**, (NMSU). Vancomycin, the Last Resort of Antibiotic
- 11:40-12:00 **Gaurav Thapa**, (NMSU). Exploring the Possibility of Bus Rapid Transit in the Urban Core of Kathmandu Valley, Nepal

12:00 – 13:00

(Session II) Lunch Break/Posters

Voice Against Cancer Representative (NMSU). Reducing Cancer Burden Globally: An Initiative of NMSU Voice Against Cancer Organization

Julio Urendra, (NMSU). Algorithmic Aspects of the Embedding Problem

Lokendra Paudel, (NMSU). Kronecker Function Rings of Ring Extensions

13:00 – 14:20

(Session III) Afternoon Session (Diaspora)

- 13:00-13:20 **Roshani Rajbanshi**, (NMSU). Vector Borne Disease—Kala Azar (Visceral Leishmaniasis) in Nepal
- 13:20-13:40 **Desh R Sonyok**, (NMSU). Evolutionary Physiology as a Deductive-Nomological Model of Corruption Behavior
- 13:40-14:00 **Pradip R Aryal**, Lokendra Paudel, Deepak Basyal (NMSU). An Initiation: Religious Model of Nepal
- 14:00-14:10 **Coffee Break**
- 14:10-14:40 Guest Speaker: **Dr. Doleshwor Bhandari**, (UNM). Why Happiness Matters?
- 14:40-15:15 Special Guest Speaker: **Dr. Megha N Parajulee**, (Texas A&M).

Fulbright Experience in Agriculture Research, Teaching, and Outreach in
Nepal: Opportunity for Fostering Collaborative Linkages

15:15-16:00	Keynote Speaker: Dr. Ambika P Adhikari , (ASU). National Development: Challenges and Opportunities for Diaspora
16:00-16:15	Felicitations to Speakers
16:15-16:20	Closing Remarks

Deepak Basyal

Conference Coordinator & Director

Academic Committee

Nepalese Student Association

New Mexico State University

Las Cruces, NM

NMSU: New Mexico State University, Las Cruces, NM, UTEP: University of Texas at El Paso, El Paso, TX, UNM: University of New Mexico, Albuquerque, NM, Texas A&M: Texas A&M University, College Station, TX; Texas Tech: Texas Tech University, Lubbock, TX; ASU: Arizona State University, Tempe, AR.

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The pivotal role of mathematical definitions in the construction of proofs

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Abstract

As undergraduates begin to take upper-division courses in mathematics they often must understand and construct proofs. Many students have difficulty with proof construction and the difficulty sometimes persists for a long time, even into graduate school. Some mathematics departments have a “transition-to-proof” course intended to partly alleviate this difficulty, but often the difficulty remains severe. The present research is concerned with investigating how students understand definitions and make correct use of them, particularly in constructing mathematical proofs. The scope and design of my research are presented here. The analysis and results are still in process.

Introduction

With this research I am examining students’ reading, “unpacking” (Selden & Selden, 1995), and understanding of definitions. I also examine how students construct proofs and the difficulties they have. The results of this study could be used in designing the teaching of transition-to-proof courses and other proof-based courses.

My proposed research concerns a persistent, widespread, national problem in learning university level mathematics, namely, upper-division mathematics undergraduates’ lack of proving skills. These students’ assessments in proof-based courses often depend greatly on their ability to construct original proofs. And it is common knowledge among many who teach such proof-based content courses that their incoming students lack appropriate proof construction skills. University teachers try to help students who are underprepared for constructing proofs, but they are constrained by the need to cover the content, therefore students’ struggles are rarely addressed properly. This is a time in their studies when some undergraduate students may, mistakenly, realize that the study of mathematics is going to require a skill that they have not developed and that may seem impossible to learn. Such students are likely to start seriously considering a non-mathematical career.

Most secondary mathematics education programs also require students (i.e., preservice secondary teachers) to complete at least one semester each of at least two advanced mathematics courses. If such students find proofs too hard and decide to leave mathematics education, this loss is a waste of resources and will reduce the future supply of secondary mathematics teachers who would help prepare the future scientific workforce. Reasoning and proof have been incorporated in the K-12 curriculum, but secondary mathematics teachers are often ill-prepared to teach proving (Knuth, 2002a, 2002b) and to address students' mathematical inquiries appropriately.

Transition-to-proof courses are designed to help alleviate undergraduate students' difficulties with proving, and no doubt, they do help. But the help seems not be sufficient for a student to do well in subsequent proof-based content courses, or to develop good mathematical reasoning skills required in a teaching career. This suggests there is more to be learned about how to teach transition-to-proof courses, and how to coordinate them with the aptitudes that are essential in students' future careers.

Some existing literature

Statements, such as definitions or theorems, often need to be interpreted or expressed in alternative ways to be useful in a student's proof. The French mathematician Poincaré (1913) in his *The foundations of science: Science and hypothesis, the value of science, science and method* publication said:

“What is a good definition? For the philosopher or the scientist, it is a definition which applies to all the objects to be defined, and applies only to them; it is that which satisfies the rules of logic. But in education it is not that; it is one that can be understood by the pupils.” (p. 430).

I agree with Poincaré's thought, but the big question this quote leaves us with is: How do we know a definition has been understood by the students?

Many definitions, theorems, and principles of logic correspond in a seemingly obvious way to actions in the proving process, which can be called their operable interpretations. However, many students do not find this correspondence obvious until they have actually carried out the actions a few times. Bills and Tall (1998) introduced a similar notion saying that a definition is formally

operable for a student if that student “is able to use it in creating or (meaningfully) reproducing a formal argument [proof]” (p. 104). Quite a few students seem to need multiple experiences with operable interpretations of definitions and theorems.

Students technically never use a definition as it is presented to them; they use what they interpret of the given definition, their concept-image of the concept-definition. These ideas were introduced by Tall and Vinner (1981).

A student’s process of constructing a proof can be viewed as a sequence of actions. These can be physical, e.g., writing a line of the proof or drawing a sketch, or mental, e.g., focusing on, and “unpacking,” the conclusion. The actions arise from situations in the partly constructed proof, together with additional information, including information from the student’s knowledge base and even from his/her feelings. It is the student’s inner situation that drives the action, but an observer may be able to construct a model of that from the outer, observable situation and the student’s actions in response to that situation (Steffe & Thompson, 2000).

Research Questions and Design

The design of this research falls within the scope of a design experiment proposed by my advisors, Drs. Annie and John Selden. They have created and lead a research group with several doctoral students; Milos Savic, Kerry McKee, Ahmed Benkhalti, and myself are part of this team.

The transition-to-proof course

The course is taught from Professor Selden’s notes, which can be easily adjusted to the maturity of the students. The teaching has resembled that of a modified Moore method course (Mahavier, 1999). That is, there is no book and there are no formal lectures. Students prove theorems, from a specially designed set of notes, as homework and, when invited, present their proofs to the class. They then receive substantial criticism, suggestions, and explanations. Sometimes there are mini-lectures when needed. One day per week has been devoted to having students “co-construct” the proof of an upcoming theorem in the notes. That is, the professor provides a brief suggestion and then invites a volunteer student to write the “next part” of the proof. This is repeated until the class as a whole constructs a proof. Logic is taught in context, as the need arises. There is also some time devoted to group work. However, due to the size of the Fall 2013 class (34 students), some of the normal teaching practices had to be modified. Instead of having students routinely go to the

board to present their proofs, the students worked on proofs in groups of three and the professors and the graduate assistant circulated amongst the groups offering advice.

All classes are videoed and field notes are being taken. These are normally analyzed between classes in research group meetings to plan students' learning trajectories (Simon, 1995) and to make empirical observations for later testing and analysis. I will use the constant comparison method (Glaser & Strauss, 1967) to analyze the interview data that I collected, as well as some of the classroom data.

Some research questions

The following is a selection of questions that interest both the research team and me.

- How can transition-to-proof course students learn to, and how can they be taught to, construct proofs that professors will consider valid?
- What specific reasoning skills would be advantageous to teach in such transition-to-proof course students and how could they best be taught?
- What contributes to students' difficulties with "unpacking" and using abstract mathematical definitions? In particular, are there certain necessary competencies? Also, what are some student difficulties encountered when "exploration" is required?

My research is particularly oriented towards the attempt to answer the final question (presented above) by examining the interview data that I have collected (described in the next section), the classroom videos, the field notes (taken by me), and the students' homework and test papers from the Fall 2013 MATH 279 class.

Data collection

The research results are intended to be paradigmatic, that is, to apply more widely to situations and students other than those in these courses. An iterative design is being used and prospective and reflective analyses are being employed to generate, develop, and test conjectures, both about the learning materials and emerging theories. Previous versions of these courses (design experiments) suggest that significant improvement in the students' proving skills and in the instructor's ability (informed by the theoretical framework) to help students improve their proving skills will be observed.

All classroom data have been, and are being, collected in the spirit of naturalistic inquiry (Lincoln & Guba, 1985) and have been, or will be, reviewed with a focus on *disciplined noticing* (Mason, 1994) so that all interesting observations are captured. The work of all students, who have signed Informed Consent Forms, in the three of the previous MATH 279 courses are available to me for research purposes.

I have designed and conducted a series of semi-structured task-based interviews with students in this class. I presented to them some, previously selected, mathematical definitions, examples, non-examples, true-false questions, and statements to be proven. The interviews took place individually in a small seminar room about 60-90 minutes long. The students wrote down their thoughts using a Live-scribe pen that recorded their hand writing in real time. An audio recorder was also used.

Analysis and prospective results

Within the qualitative data obtained from the interviews and observations I will search for difficulties the participants encountered when dealing with the mathematical definition presented. I will undertake a retrospective analysis of all collected observations. I will use inductive category coding (Goetz & LeCompte, 1981) and inductive analysis (Patton, 1990) so that patterns, themes, and categories of analysis “emerge out of the data rather than being imposed on them prior to data collection and analysis” (Patton, 1990, p. 390). I expect from this analysis some emerging categories that will inform me to propose supported answers to my research questions. These categories will be related to the theoretical framework developed by my advisors and will also be rooted in the empirical data. “The analyst moves back and forth between the logical construction and the actual data in search for meaningful patterns” (Patton, 1990, p. 411).

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Moisture Susceptibility of Asphalt Concrete

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Key words: stripping, raveling, hydraulic scour, dynamic modulus, dense graded hot mix asphalt, moisture induced stress tester

Abstract

Moisture damage in asphalt concrete causes loss in mechanical properties of asphalt material due to the presence of moisture in its microstructures in a liquid or vapor state. Some of the common types of distresses observed in asphalt pavements due to the moisture damage are stripping (separation of asphalt binder and aggregate), raveling (dislodgement of aggregate particles in asphalt mixture from surface) and hydraulic scour (process that occurs on a saturated surface by which the pavement material is eroded due to dynamic action of tires in presence of water). Excessive stripping in pavements causes severe pavement deformation which results in failure of pavement surface. This paper focuses on the research on the effect of moisture in Dense Graded HMA samples using an accelerated moisture conditioning technique in the laboratory. The current laboratory work consists of preparation of samples from a HMA mixture type commonly used by Texas Department of Transportation. The samples are conditioned with moisture in a MIST (Moisture Induced Stress Tester) machine which applies repeated water pressure on samples to simulate the repeated traffic loading on a moisture intruded pavement layer. Dynamic Modulus test of the samples using AASHTO – TP 62-03 is carried out both before and after 500, 3500 and 5000 cycles of moisture conditioning in MIST to see the change in dynamic modulus and percentage air void in the samples. The research focuses on correlating different levels of such moisture conditioning with the dynamic modulus and air void content of asphalt samples.

Samples were prepared with an average of $7\% \pm 1\%$ air voids in the laboratory. Laboratory test results so far have shown that the conditioning of sample with moisture in MIST decreases the

value of dynamic modulus in average. The result showed that there is a sharp fall in the value of dynamic modulus for the first 500 cycles. These values seemed to either increase or stay steady for an additional 3000 cycles and decrease further after 5000 cycles. The reason for the increase in the dynamic modulus value after 3500 cycles of MIST conditioning is due to aging of asphalt concrete which oxidizes the asphalt binder and stiffens the mix due to MIST conditioning. After possible aging, conditioning the sample in MIST deteriorates the asphalt mix. Further analysis of data is needed to be carried out in order to find out the correlation between the number to cycles in MIST and dynamic modulus value. The samples were tested with only one type of mix design due to the time constrain. It is recommended for further research that samples with different mixes can be prepared and tested to see the effect of MIST conditioning.

Figures



Figure 1 Placement of sample in MIST

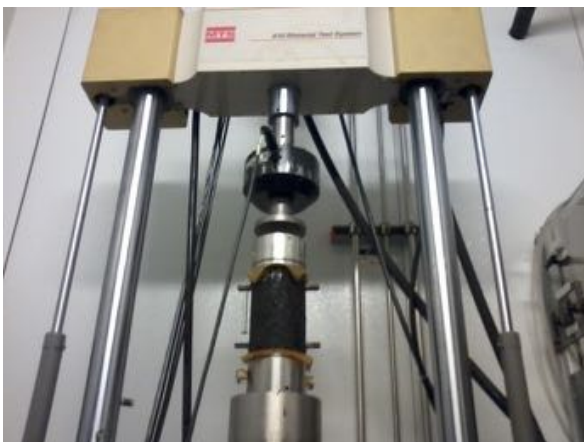


Figure 2 Dynamic modulus testing of sample in MTS machine

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How to Explain the Definition of Stochastic Affiliation to Economics

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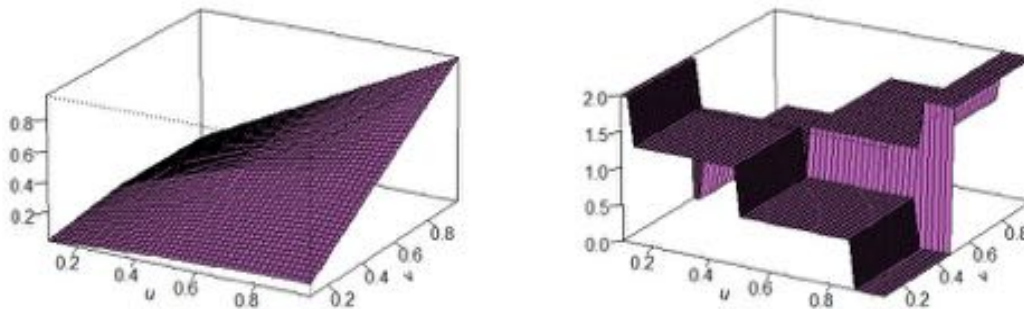
To formally describe the intuitive idea of "positive correlation" between two quantities, it is often helpful to use the notion of stochastic affiliation. While this notion is useful, its usual definition is not intuitively clear -- which make it difficult to explain this notion to, e.g., economics students. To help students understand this notion, in this paper, we show how the notion of stochastic affiliation can be explained in clear probabilistic terms.

Dependence concepts such as affiliation, association and positive lower orthant dependent are studied in terms of copulas [1,2,3,4]. Relationships among these dependent concepts are obtained. An affiliation is a notion of dependence among the elements of a random vector and some measures of it are provided in bivariate case. It has been shown that the affiliation property is preserved using linear interpolation of subcopula[3,4]. For example [3], consider the experiment of tossing a fair coin 3 times. Let X be the total number of heads observed and Y be the number of heads on the second toss. Then the joint mass of X and Y and its corresponding copula are given by

Y \ X	0	1	2	3
0	1/8	2/8	1/8	0
1	0	1/8	2/8	1/8

U \ V	1/8	4/8	7/8	1
1/2	1/8	3/8	1/2	1/2
1	1/8	4/8	7/8	1

It is easy to see that the subcopula is affiliated. The corresponding copula are also easy to calculate. The plots of $c(u,v)$ and $C(u,v)$ are given in Figure 1. From Figure.1, it is easy to see that $c(u,v)$ is affiliated because the points in the diagonal are larger than the off diagonal points.



As an application, the affiliation property of skew-normal copula is investigated. For illustration of dependent concepts and their relationships, several examples are given.

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Vancomycin, last resort of antibiotic

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Lead compounds for antibacterial chemotherapy, and in general all chemotherapy, are obtained from two sources: chemical synthesis and natural products (David R. Spring-2013). The development of antibacterial chemotherapy has its roots in the late 19th century, with the observations of contemporary microbiologists, Robert Koch and Louis Pasteur, about the antagonistic activity between microbial populations, and in Paul Ehrlich's search for a "magic bullet" capable of selective toxicity towards bacterial cells. (N. C. Lloyd, H. W. Morgan, B. K. Nicholson, R. S. Ronimus, *Angew. Chem.* 2005, 117, 963–966; *Angew. Chem. Int. Ed.* 2005, 44, 941–944.). The development of antibiotic has been one of the great success in the field of medicinal chemistry, yet it remains challenge because of the outbreak of antibiotic resistant bacteria. Bacteria such as *Staphylococcus aureus* has been a serious problem in the medicinal field because of its resistivity against different existing antibiotics. In the developed countries the death from bacterial infection has been dropping but it is a major cause of death in the developing countries. *Staphylococcus aureus* is very common bacteria and it is deadly if it gets into blood stream. Its infection is being the major cause of the death following surgery in USA. In USA, 2 million people carry *S. aureus* and 50 million people carry MRSA (methicillin resistant *S. aureus*).It kills more people than the AIDS and breast cancer combined in USA.

Vancomycin became available for clinical use more than 50 years ago but was discarded because scientist developed other more effective and less toxic antibiotics. A brief history of this antibiotic; in 1950 Eli Lilly and company isolated a compound (compound 05685) from the sample of dirt collected by missionary in Borneo. The compound was found to be active against gram positive bacteria including penicillin resistant staphylococci .In vitro experiment and subsequent animal experiments suggested that the compound was safe and effective in humans. After passing through ion exchange resin the compound was named as vancomycin and was available for clinical trials.

Clinical trials were carried out and the reports of successful treatment were organized and submitted to the USA FDA and was immediately approved by FDA in 1958. Because of some toxicity related to the vancomycin like venous irritation ,chills, nephrotoxicity and red man syndrome it was reserved from being used. But later because of widespread appearance of antibiotic resistant pathogens like MRSA vancomycin became the choice again in 1980s. Currently it is approved as generic drug by FDA as vancomycin hydrochloride on 4/9/2012.

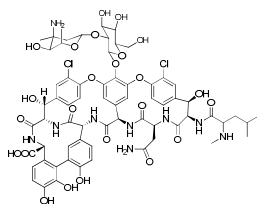


Fig: The structure of Vancomycin

Mechanism of action: Vancomycin is a glycopeptide class of antibiotic. It inhibits the bacterial cell wall synthesis by hydrogen bonding interaction with the terminal D-alanyl-D-alanine moieties of NAG/NAM peptide and hence the bacterial cannot synthesize the cell wall consequently cannot multiply and grow.

1. History of Vancomycin. CID 2006:42(Suppl 1). S5
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Exploring the possibility of Bus Rapid Transit in the urban core of Kathmandu Valley, Nepal

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Problem Statement

What is the potential for Light Rail Transit/Bus Rapid Transit (LRT/BRT) in Kathmandu and where in the city should the routes be located?

This extended abstract frames the discussion for the introduction of BRT/LRT in the Kathmandu valley in order to evaluate the possibility of installing a LRT/BRT system in Kathmandu Valley by examining the installation and implementation of Bus Rapid Transit (BRT) and Light Rail Transit (LRT).

Introduction

Kathmandu, the capital city of Nepal and its surrounding urban agglomeration has been the center of strategic power, politics, culture and commerce of Nepal since the existence of the modern country. Kathmandu Valley accounts for approximately one twelfth of the entire population of Nepal and continues to grow at an annual rate of 5.2% (Thapa and Murayama, 2010). According to the 2011 Census preliminary report, the entire population of Kathmandu Valley stands at 2.51 million. In 2001 the population of the valley numbered 1.6 million thus, an increase of 63.7% in the last decade. The increase in population has happened due to large scale in-migration from other parts of Nepal and natural population growth. This rapid unplanned population growth has resulted in serious problems such as congestion, environmental pollution and severe traffic gridlock (Haack and Rafter, 2006).

Apart from the high population growth of Kathmandu Valley, it has also witnessed a phenomenal growth in private vehicles (e.g. motorcycles and cars) due to the rise in income of ilarge section of its people and the availability of low cost personal loan schemes. Leasing or buying cars through personal loans was not a possibility before the year 2000 (Ale and Shrestha, 2009). Compared to

bus transport in developing countries, personal vehicles have been found to consume approximately 8–10 times more fuel, run 35 times the mileage and produce anywhere between 30–50 times more air pollution (Pradhan, Ale, and Amatya, 2006). This rise in vehicle population with no right of way for public transit has meant that in order for there to be smooth traffic flow within Kathmandu Valley, it will have to consider right of way mass transit in the near future.

Literature Review

Demographics

The 2011 census shows that Kathmandu and the rest of the urban areas in Nepal are growing rapidly. The “Kathmandu Valley Long Term Development Plan,” prepared by the Kathmandu Valley Town Development Committee in 2002, projected a population of 2.6 million in 2021. However, urbanization has been far more rapid than predicted, given that the population of the Kathmandu Valley had already reached 2.5 million in 2011 (Muzzini and Apparicio, 2013). Thus, there is a great need for updated data to be used to better understand the role of public transit in the Kathmandu Valley.

Transportation and Politics in Nepal

The study area chosen tries to limit the size of the Kathmandu Valley metropolitan region to the urban core. Even while doing this, it is important to understand that the study area crosses local administrative boundaries. Kathmandu’s primary status amongst cities in the country means that there is a constant push to influence the running of the city by the central (national) government. The last elected mayor served Kathmandu from 1997-2001; the city has not seen any locally elected official ever since (Rauniyar 2011). This has led to several problems in coordination between local interests and central authorities. Political instability has also meant that the roles of departments, institutions and administrations change frequently. At various stages the traffic within the city has been seen as the domain of the Metropolitan Traffic Police, the Ministry of Infrastructure and Transportation or the Ministry of Urban Development. The Ministries themselves have also been through several reorganizations and restructurings.

The instability of the decade long civil war (1996-2006), followed by the political instability where six different people controlled the government in the last five years led to an absence of any long

term planning policies. Going as far back as 2005 Pradhan, Ale and Amatya stated that a policy of introducing more public buses is an absolute necessity, yet policies have failed to materialize. The private companies currently running public transit in a cartel like manner wield immense power and being able to make them understand how a successful Bus Rapid Transit (BRT) system operates is vital. Ernst (2005) states that sending private sector bus operators from Jakarta, Indonesia to Bogota in order to provide rapid transfer of knowledge was critical in fostering a political will to introduce a public mass transit system in Jakarta, Indonesia.

Light Rail Vehicles (LRV) and Rapid Bus Transit

The growth in Kathmandu's private vehicles has created a growing list of problems. Mackett and Sutcliffe (2003) state that the likely success of a Light Rail Transit (LRT) hinges on providing a high quality service that results in drivers leaving their cars for light rail vehicles. In the ever urbanizing world, where populations have grown and congestion increased LRTs have gained in popularity. A successful LRT system brings with it several benefits such as increasing modal share of public transit, reduction of traffic congestion, improvement in air quality, improvement and development at the city center and generally improving the pattern of urban growth in a city. The increase in modal share does not come out of other public transit system, but mostly from private vehicles.

In order for these benefits to be generated many of them hinge on the physical and socio-economic characteristics of the urban area where the LRTs are built. Mackett and Sutcliffe (2003) looked at eight cities with similar physical characteristics as Kathmandu, but they differed starkly in terms of socio-economic characteristics. However, the differences can be overcome if the route locations, cost, operating policies, transport planning policies and urban planning policies can be aligned. One of the easiest ways to overcome the socio-economic disadvantages of Kathmandu would be to look at BRTs as a cheaper alternative to LRTs.

Modal Choice and Travel Demand

The importance of high-occupancy vehicles is fairly obvious to everyone living in the Valley. Yet there has not been an increase in their use, but a decline over the years. A large reason for this has been the lack of road infrastructure for the large vehicles and preference for personal vehicles. The narrow roads of Kathmandu have meant that public transit investors put in money to purchase the much smaller micro-busses and run them. In congested streets these smaller micro-buses are also

more fuel efficient than large buses. This led to private investment being made towards this sort of vehicle (Shrestha and Rajbhandari, 2010). The available public transportation modes in the valley are 3-wheelers (locally known as Tempos), buses (35-40 seats), minibuses (20-25 seats), microbuses/vans (12-17 seats) and taxi cabs (3-4 seats). The total vehicle fleet in the valley has increased at an annual average rate of 14 percent during 2000-2010; however, the annual average rate of public vehicle has actually dropped down from 6 percent from 2000-2005 to 5 percent during the 2006-2010 period (Shrestha, Nguyen, Xu, Rupaltheke, and Lawrence, 2013).

In 2004, public transport modes met about 57 percent of the total travel demand in the Valley, while private modes, such as cars and motorcycles, met 41 percent. Motorcycles and private cars constitute 71 percent and 17 percent of the total operational vehicles respectively, but they meet about 25 percent and 16 percent of the total travel demand respectively. Micro-buses meet about 6 percent of the total travel demand, whereas buses and minibuses together meet 37 percent of the total travel demand but make up only 1.4% of the total operational vehicle (Dhakal, 2006).

Bus Rapid Transit in Jakarta, Indonesia

Most of the models for BRTs in developing countries come from Latin America; however, they don't perfectly correlate to developing Asian countries. A look at the process of introducing BRT in Jakarta serves to highlight some of the hurdles that Kathmandu will face and also why Kathmandu is ripe for BRT introduction.

Ernst 2005 states that three critical characteristics are needed for successful BRT implementation in developing countries. These are

1. High population density
2. Significant existing modal share of bus public transportation (37 percent for Kathmandu)
3. Financial constraints providing a strong political impetus to reduce, eliminate, or prevent continuous subsidies for public transit operation.

In addition to the three basic conditions, in year 2000 Jakarta faced chronic traffic congestion and pollution problems. The congestion was estimated to cost the city around \$600 million annually (Ernst, 2005). The Metropolitan Traffic Police website (www.metro.nepalpolice.gov.np) of Nepal states that while there has been approximately 50 percent population increase during 1995-2008, the vehicle growth rate within the valley in the same time period was 399 percent. This reliance

and preference for private vehicles have exacerbated the problems of congestion and pollution in the city of Kathmandu.

The Guardian reported in 2014 that "Nepal's air quality ranks 177th out of 178 countries" with smog in Kathmandu five times worse than the levels which prompted Paris to ban cars. The air pollution is at a far more critical stage than when Jakarta in the 1980s reported total suspended particulate (TSP) measurements exceeding 600 mcg per m³ with almost 40 percent of this due to the transportation sector. This information was integral in pushing Jakarta to introduce a BRT system. The environmental impact of having a LRT/BRT system is profound for the improvement of air quality and reduction of noise pollution. The bowl shaped nature of the valley along with low wind speed means that most of the PM₁₀ particles released by motor vehicles fail to escape the valley and plague its citizens. Nepal almost exclusively relies on hydropower for electric generation so a mode of transportation that relies on electricity would be carbon neutral at every step of the electric process. Thus, the importing and reliance on fossil fuel would dramatically change if a greater amount of the travel demand were to be met with a LRT/BRT system.

When Jakarta finally managed to introduce a single corridor of BRT without proper stations, failing to re-route existing competing public transit and not developing new road infrastructure, the system still managed to make 20% of its passengers switch from private vehicles to the new busses (Ernst, 2005). With Kathmandu unlikely to run a perfect BRT this sort of statistic has to be viewed as promising.

With Nepal importing gasoline from the Indian Oil Corporation (IOC) then subsidizing the fuel for consumption there is a huge financial incentive to cut down the demand for oil. On April 24, 2014 a local newspaper Republica reported that The Nepal Oil Corporation, which is tasked with importing and then distributing the oil that it receives from India had an outstanding bill of 5.3 billion rupees. Almost 80-90 percent of this oil is used by the transportation sector, there is a great financial pressure to reduce this dependency on foreign oil.

Conclusion

There is an immense need for LRT/BRT system in Kathmandu Valley. Several indicators that are ideal for a LRT/BRT system to be successful seems to be available including high density population, high travel demand, high trip distribution within the urban core, congestion and limited

parking availability for private cars in the urban core. The big challenges seem to be at the policy level where there continues to be a misunderstanding about public transportation. There also seems to be a fear to bring about drastic changes to the current political structure of the transportation industry. Political instability has also meant that long term policies do not get planned and implemented.

The second biggest hurdle for a poor country like Nepal is the feasibility of embarking on such a large scale project. It is hoped that by the end of this research enough evidence and concrete models depicting routes for exclusive lanes or tracks can be developed to better visualize a LRT/BRT within the Kathmandu valley and overcome the first hurdle.

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Vector Borne Disease—Kala Azar (Visceral Leishmaniasis) in Nepal

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Abstract

Kala-azar is vector borne disease and one of the most infectious diseases. This study is focused on the kala-azar affected countries and specifically on three countries namely: Nepal, Sudan and Brazil. Twelve million people are affected by kala-azar worldwide and 57,000 deaths are reported annually (WHO, 2007). In Nepal, the disease is seen in the areas close to Bihar, India. For treatment Sodium Stibogluconate is used. In Nepal, people are resistant to Sodium Stibogluconate treatment. Co-infection of HIV/Visceral leishmaniasis is creating problem in the treatment. The climatic factors are associated with the distribution of the vector. High temperature, low rainfall, humidity are the factors that increase infection. The presence of garden around the house, clayey soil, deforestation and house near pond or river are considered as risk factors for kala-azar. Besides these, access to health service, overcrowding, lack of safe drinking water, poor nutritional status, drought and civil war have positive association with kala-azar.

Introduction

The disease Kala-azar (KA) or Visceral leishmaniasis (VL) is caused by protozoa *Leishmania* species. The disease is transferred by a vector sandfly, *Phelbotomus* species. The sandfly carries the parasite and transfer the disease to a host. Human and other animals such as dogs (main reservoir), Nile rats, donkey and horses are reservoir of the disease. During the blood feeding process, the infected vector, sandfly, transfers the parasite from its saliva to a healthy human or animal (de Moura et al., 2007). Thus “KA is defined as the presence of parasite *Leishmania* species on lymph node or bone marrow in human being or in animal” (Zijlstra et al., 2000). The disease is also known as Black fever, and dum dum.

The KA has been reported from eighty eight different countries (PAHO, 2007) and mainly in tropical-subtropical parts of the world. This study was focused on kala-azar affected countries and mainly on three different countries namely: Nepal, Sudan and Brazil and also provides details on the disease KA and discusses current topics relating to control and prevention of KA in different regions. It is estimated that around twelve million people are infected worldwide and 350 million people are at risk (PAHO, 2007).

In Nepal, the disease is seen in the areas close to Bihar, India. It has been reported that 90% of leishmaniasis occurs in India (largest), Bangladesh, Brazil, Nepal and Sudan. The disease affects the poorest of the poor; eighty-nine percent of the victims earn less than \$ 2 per day (Weekly epidemiological record, 2002). Each year 50,000 deaths are suspected and 2 million lives are considered to be in disability due to VL by Disability Adjusted Life Years (PAHO, 2007). In the same study, it has stated that an estimated 1.5 million cases are reported primarily from Brazil, East Africa (Sudan) and Asia (India). The report by Bern et al., (2000) showed that the number of cases of VL reported in India was more than 80,000 in 1992.

Scenario of Nepal

VL has been endemic in Nepal since 1950s (Bern et al., 2000). Twelve districts of Nepal which are close to Bihar and West Bengal States of India (endemic for KA) are affected by KA. In these areas, more than 5.6 million people are at risk (Annual Report, Department of Health Services, 2005/06). The study of Singh et al., (1999) showed that very less work has been done on KA in children of Nepal. rK-39 dipstick is used to detect kala-azar in Nepal (Annual Report, Department of Health Services, 2005/06). All treatments of KA are very expensive. In Nepal pentavalent antimony as SSG is recommended by WHO as it is affordable by the poor people. Information on the kala-azar cases is shown in table 1, and figure 1 shows the rising number of cases in Nepal.

Year	No. of KA cases	Affected Population	No. of deaths	Incidence rate	CFR (%)
2004	1588	1604741	32	98.95	2.01
2005	1463	1517098	21	96.43	1.43
2006	1531	1046852	14	146.24	0.91

Table 1: KA cases from 2004-2006 in Nepal (Source: Annual Report, Department of Health Services, 2005/06)

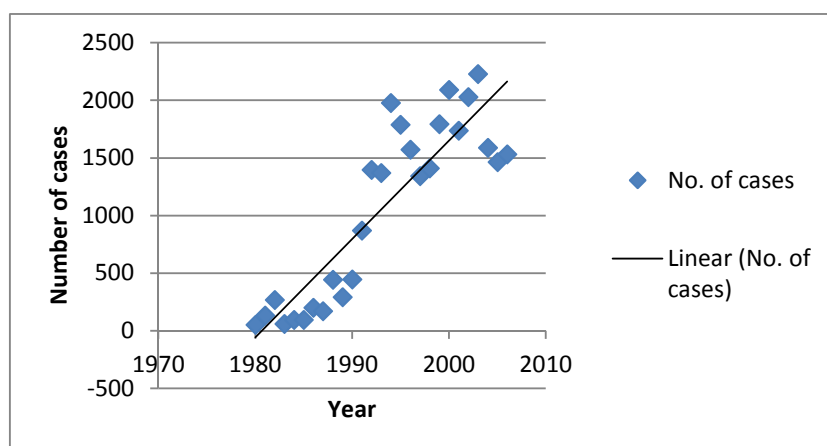


Figure 1: Projected graph for Nepal.

Discussion and Result

More detailed information on kala-azar is presented in Table 2. Cow dung provides shelter to the vector and promotes kala-azar in Nepal. Cross-border movement between Nepal and India in the border area causes the spread of the disease in Nepal (WHO, 2002). Drought is a major cause for the spread of the disease in Sudan and Brazil (Rey et al., 2005). The civil unrest and drought caused migration of people which enhance the spread of the disease in Sudan. The climatic factors are associated with the distribution of the vector. High temperature, low rainfall, humidity are the

factors that favors more infection. The presence of garden around the house, clayey soil, deforestation and house near pond or river are considered high risk factors for kala-azar. Besides these, access to health service, overcrowding, lack of safe drinking water, poor nutritional status, drought and civil war have positive association with kala-azar. Ownership of cattle in Nepal shows negative relation to the ownership of dogs in Brazil with regards to the occurrence of kala-azar. Deforestation brings change in the climate which favors the occurrence of the disease. In Nepal, more males were reported to have been infected with kala-azar than females which was opposite in Sudan. One possible explanation can be related to the activity of male and female. Men usually work outside in the field whole day including dusk and dawn when the activity of the sandflies is more. The other possible explanation to this can be related to the socio-economic condition of Nepal. Even if the female number is more in Nepal, only the male gets the privilege of getting treated as Nepal is male dominated country. And the data collected are usually from the hospitals. For treatment Sodium Stibogluconate is used. In Nepal, the parasite is resistant to Sodium Stibogluconate treatment. Co-infection of HIV/Visceral leishmaniasis is creating problem in the treatment. Usually people with weak immune system are prone to disease; therefore, young, elderly and people with HIV whose immune system is weak get the disease.

Determinants/ Countries	Nepal	Brazil	Sudan
Parasite	<i>L. donovani</i>	<i>L. braziliensis, L. guyanensis</i>	<i>L. donovani, L. major</i>
Vector	<i>P. argentipes</i>	<i>Lutzomyia longipalpis</i>	<i>P. papatasi, P. orientalis</i>
Host	Human beings	Fox, dogs, rats, horses, donkeys, mule and human	Nile rats and human
Rainfall	Low rainfall	-	Low rainfall
Climate	Dry season favors	-	Post monsoon
Temperature	High	-	High
Vegetation	Presence of garden and weed	Presence of garden	Acacia seyal, Belanites aegyptiaca and vertisol

Soil Type	Alluvial soil	-	Clay
Population movement	+	+	+
Poor access to health services	+	+	+
Poor nutritional status	+	+	+
Co-infection of HIV and VL	Not recorded	Highest number	Few cases

Table 2: Summary of determinants and risk factors in three different countries.

Conclusion and Recommendation

Nepal, Sudan and Brazil are located on three different continents with different socioeconomic conditions and geographical condition. However, the same disease, KA is found in these countries. In South America—Brazil, in East Africa—Sudan, and in Asia—India shows complications with high number of infected people. In conclusion, the disease is caused by the protozoan *Leishmania* spp. The disease is spread by the vector sandfly. The likelihood of infection or disease to a particular sex is not substantiated. The occurrence of the disease is bases on different factors such as presence of causative agent—*Leishmania*, presence of hosts—dogs and human beings and the presence of vector—sandfly. These are important for the completion of the life cycle of *Leishmania*. The presence of vector in a surrounding depends on the climatic factor. The high temperature (35-37°C), low humidity, clayey soil and dry season help in the increased activity of the vector.

Based on this study, few recommendations have been made. Since the disease occurs to the poor people whose immune system is weak, it is recommended that government should help people with early diagnosis, detection and treatment of the disease in rural areas. Easy access to the health care in endemic area is highly recommended and free or low-cost drugs should be made available.

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Extended Abstract:

Preliminary Study on Evolutionary Physiology as a Deductive-Nomological Model of Corruption Behavior

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Key words: Corruption behavior, evolutionary physiology, thrifty genotypes, metabolism

Introduction

Corruption is a timeless phenomenon prevalent throughout the world in various level and scope. In general, corruption is “the abuse of entrusted power for private gain” (Transparency International 2014). Corruption covers a broad range of human action, therefore, there is no universal “one line” definition of corruption (Philps 1997). Phenomenon of corruption is deep-rooted in every human society. It is as old as organized human life and as old as government itself (Klitgaard 1988). “Corruption is a cross-temporal, cross-systemic and cross-cultural phenomenon” (Farrales 2005). It can exist under any form of government, in any country or state, and at any time. Due to the nature and extent of its effect on an economy, society or a political system, there has been enormous research and study on understanding corruption from all parties - academia, non-governmental and governmental institutions. Social and political scientists begin their analysis based on the idea that “man is by nature a political animal.” However, from biological point of view, human behavior is product of an interactive relationship between biology and its surrounding environment (Garland and Carter 1994; Hatemi and McDermott 2011). Evolutionary biology/physiology, genetics, and psychology together with surrounding environment determines individual’s behavior. This preliminary study is an exploration into the possibility of link between intrinsic human behavior and evolutionary biology in an attempt to explain some corruption behavior.

Methods of Analysis

From the analytical point of view, corruption will occur if the corrupt gain is greater than the penalty if caught multiplied by the likelihood of being caught and prosecuted (Klitgaard 1988). However corrupt gain itself is subjective and difficult to quantify when a size of the corrupt gain be large? The corrupt gain or the degree of corruption can be approximately represented by a modified metaphorical formula (original by Klitgaard, 1997) for corruption by Stephan (2012) as:

Degree of corruption = Monopoly + Discretion – Transparency - Morality

This modified model incorporates the moral dimension which has intrinsic and extrinsic component. The intrinsic component refers to a mentality problem which is associated with human biology whereas the extrinsic component represents external circumstances (environmental factor) such as poverty, inadequate remuneration, inappropriate work conditions etc.

According to Neel's "thrifty gene" hypothesis (Neel 1962), a thrifty genotype evolved under conditions of feast and famine during Paleolithic times. Thrifty genes are the genes which enable individuals to efficiently collect and process food to deposit fat during periods of food abundance. This "thrifty" metabolism by efficiently storing excess dietary energy as body fat when food was abundant would have provided a survival advantage for hunter-gatherer populations during later periods of famine. This would give rise to evolutionarily programmed biochemical cycles in our body. Therefore, human body store fat in preparation of upcoming famine as a part of the survival strategies. This physiological process was advantageous for hunter-gatherer populations but detrimental in the modern world due food abundance. Similarly, higher eating frequency is associated with lower body weight (Kaisari et al 2013). This phenomenon can be interpreted as feeding at regular intervals send a signal to the body that it doesn't have to store calories. This is also observed from regular eating habit of bodybuilder and professional fitness models. Eating irregularly or in a long interval put the body into starvation mode which signal body to store fat whenever food is available for survival.

The above discussed fat storage mechanics could serve as a Deductive-Nomological Model to explain corruption behavior. Corruption behavior resulting from need base or perceived survival insecurity can be explained with an analogy of fat storage metabolism linked to evolutionary physiology. Basically, human are driven by two biological instincts: life instincts and death instincts (Freud, 1933). The life instincts relates with the motive to survive against all odds and the fulfillment of other bodily need. Biologically human beings are built to be triggered into these

instincts. Extreme underpayment and uncertain future could be perceived as a survival risk. Thus corrupt actors outweigh benefits of corruption against its costs giving rise to corrupt behavior. Addition of survival risk factor on “morality” of the above equation results higher degree of corruption. This hypothesis can also be interpreted from the relationship between corruption perception index (CPI) and gross domestic product (GDP) per capita of the countries (Figure 1). In general, countries with lower GDP has lower CPI. According Transparency International, CPI ranges from zero to ten, where zero indicates high levels of corruption and 10 indicates low levels.

Concluding Remarks

- There was no previous literature on effect of evolutionary physiology on human psychology relating to corruption behavior
- This study indicates possibility of link between intrinsic human behavior and evolutionary biology in an attempt to explain some corruption behavior
- Extreme underpayment and uncertain future could be perceived as a survival risk. Thus corrupt actors outweigh benefits of corruption against its costs giving rise to corrupt
- Corruption behavior resulting from need base or perceived survival insecurity/risk can be explained with an analogy of fat storage metabolism linked to evolutionary physiology
- Fat storage mechanics explained by “thrift genotype” could serves as a Deductive-Nomological Model to explain corruption behavior

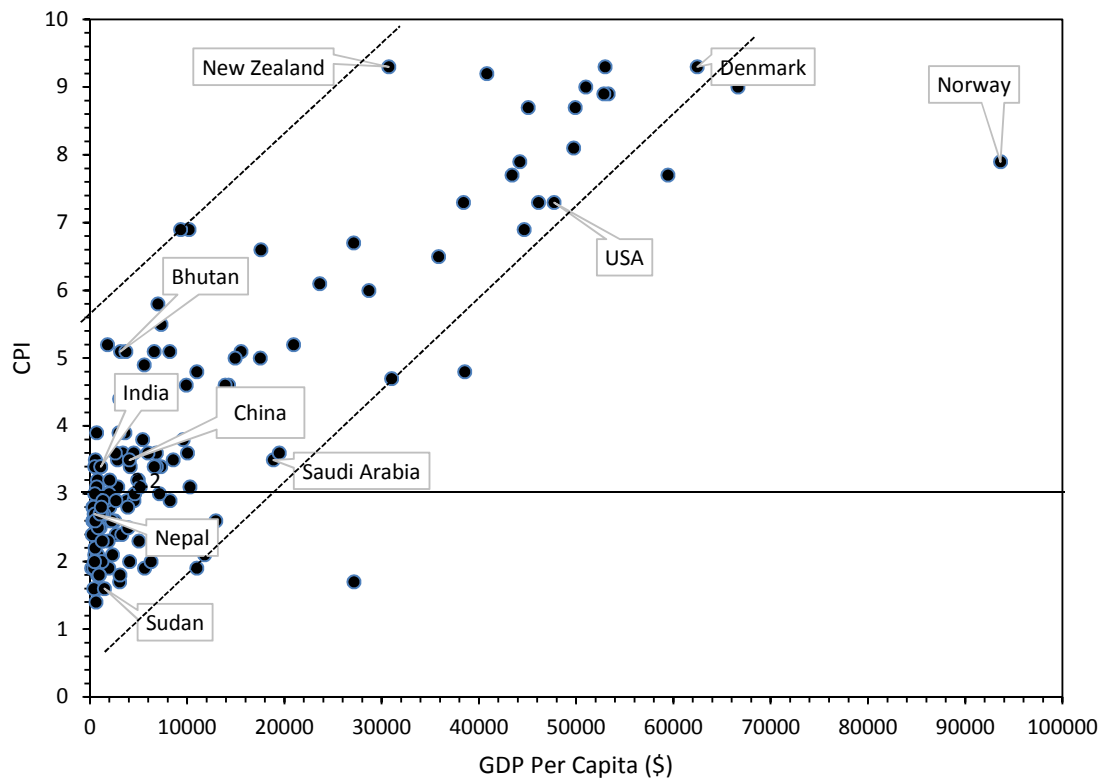


Figure 1. Relationship between Corruption Perception Index vs GDP Per Capita. Higher CPI index indicates less corruption (Data source: Transparency International 2008)

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**Fulbright Experience in Agriculture Research, Teaching, and Outreach in Nepal:
Opportunity for Fostering Collaborative Linkages**

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Higher education in agricultural sciences in Nepal formally began in 1972 with the establishment of Tribhuvan University's Institute of Agriculture and Animal Sciences (IAAS) in Rampur, Chitwan. Today, Nepal has three agricultural universities (TU Institute of Agriculture and Animal Sciences, Himalayan College of Agriculture Science and Technology (HICAST) in Bhaktapur, and Agriculture and Forestry University (AFU) in Chitwan) and several agricultural colleges and polytechnic institutes throughout the country. While these agricultural institutions focus primarily on training agricultural scientists and specialists, Government of Nepal/Department of Agriculture conducts agricultural outreach through its district agricultural development offices in all 75 districts. The country's agricultural research is shouldered by Nepal Agriculture Research Council (NARC), which coordinates research activities through its five regional headquarters and several research stations throughout the country. The author had an opportunity to spend about five months in Nepal as a Fulbright Senior Fellow for Agriculture. The assignment entailed visiting an extensive number of agricultural academic institutions, government research institutes, private farms, and non-governmental organizations engaged in agricultural development. This article highlights the functioning of these institutions as it relates to agricultural manpower development, research, and outreach. Current challenges and future prospects of these agricultural institutions in Nepal's overall agricultural development are discussed.

Nepal takes a great pride in owning the tallest peak (Mount Everest - 29,028 ft) to the deepest gorge (Kali Gandaki Gorge – 18,278 ft) in the world. With this extreme elevation, Nepal offers an incredible geographic variation for the size of the country, with three distinct climatic zones: terai plains region, elevated flatlands and hills, and mountain region. These three major geographic/climatic zones have given rise to several agroecological regions. These diverse agroecological regions allow for exceptional and unique agriculture diversity in Nepal. This

agricultural crop diversity ranges from cereal crops (rice, maize, and wheat), pulses, sugarcane, and industrial crops (rubber, tea, and jute) in the terai region to specialty spices and high-quality temperate fruits in the lower mountain region, while the elevated flatlands and hills provide an ideal environment for sub-tropical fruits, vegetables, coffee, tea, and other industrial crops.

Despite the formal establishment of the Institute of Agriculture and Animal Sciences in 1972 (IAAS, 2011), the growth of agricultural higher education institutes in Nepal remained stagnant for the next 30 years. However, the recent decade is marked by a significant growth in agricultural higher education institutions in Nepal, including two new universities, Himalayan College of Agriculture Science and Technology (2000) and Agriculture and Forestry University (2010), plus several private agricultural institutes and polytechnic colleges (Fig. 1). The author visited most of these institutions and delivered invited lectures and participated in scientific interactions. Based on those visits and interactions, the author draws the following remarks with regard to the current state of agricultural higher education in Nepal:

- Extreme political interference has hindered the quality of education, which is not surprising given the political instability in the nation.
- The oldest agriculture institution, Institute of Agriculture and Animal Sciences Central Campus, has been displaced from Rampur, but the new Agriculture and Forestry University that displaced IAAS has not gained any traction.
- HICAST has failed to develop itself into an international level agriculture institution after over a decade of its establishment.
- New affiliated colleges (e.g., Dang, Baitadi) need greater resources and TU's attention.
- Coordination amongst universities and government agricultural institutions is weak; individually they seem to be doing well.

Together with these observations, the author offers the following views:

- Despite extreme political interference in academic institutions, the production of agriculture manpower is quite sufficient for Nepal's current need; however, the quality of practical education and synergism amongst expertise could be improved.
- Strong network of agricultural specialists amongst university, NARC, Government of Nepal/Agriculture Department, private industry, and NGOs is much needed to complement various disciplines and programs and to reduce redundancy.

- Coordination among teaching, research, and outreach activities is lacking, but it offers an opportunity for developing a new integrated model of agricultural education in Nepal.
- High officials in every agricultural sector in Nepal are connected to Rampur, which should serve as a unifying variable for political leverage in advancing overall agricultural growth and development in Nepal.
- There are boundless opportunities for Nepalese agricultural expatriates to offer their personal service for Nepal's agricultural growth and development. In return, Nepal's agricultural institutions offer tremendous opportunities for fostering long-term collaborative linkages for agricultural research.
- These institutions should also develop attractive research-teaching-extension curricula for international researchers to seek tangible collaborations. An effective way for young scientists from these nascent institutions to publish their research in international journals is via effective collaboration and partnerships with international institutions.



Fig. 1. Institutions of agricultural higher education in Nepal (★). Most institutions are located around the central part of the country.

Nepal's agricultural research is primarily overseen by Nepal Agricultural Research Council (NARC). Until 1991, Nepal's agricultural research and extension services were both under the Government of Nepal/Department of Agriculture. The extension service was provided via District Agricultural Development offices in all 75 districts, whereas agricultural research was performed via regional and national research centers. These research centers were generally commodity based

and regionally adapted. For example, National Maize Research Center was in Chitwan, National Wheat Research Center was in Bhairahawa, etc. In 1991, an autonomous agricultural organization, NARC, was established under the Agriculture Ministry with the mandate to: a) conduct qualitative studies and research on different aspects of agriculture, b) identify existing problems in agriculture and find out the solution, and c) assist government in formulation of agricultural policies and strategies. While the idea of separation of research and extension from the Department of Agriculture was sound, the implementation was plagued with political interference and the original intent of such separation did not materialize. As a result, not all research centers from the Department of Agriculture were transferred to the newly minted NARC nor the autonomy of NARC, as envisioned in the charter, was implemented. Nevertheless, there is now one regional research center at each of the five developmental regions in the country. In addition, there are several agriculture research stations within those regional centers (NARC, 2010). The author observed some significant research conducted at those centers that he visited. He had the opportunity to visit all five regional research centers (Tarahara, Sunsari; Parwanipur, Parsa; Lumle, Kaski; Khajura, Banke; and Dipayal, Doti). While these centers are not all fully equipped with research facilities, scientists appeared to be highly innovative and productive. They too would benefit with international linkages, especially with regard to information sharing and publication of their fine research.

The author also visited several district agricultural development offices, NGOs (Helvetas, FORWARD, and Namsaling Community Development Center), private farms (tea farms in Ilam and Jhapa, rubber farms in Jhapa), and agricultural development banks. Altogether, at least 37 of the 75 districts were visited that provided the opportunity to interact with nearly every sector of agriculture enterprise in Nepal (Fig. 2). The entire Fulbright assignment was capped with several rounds of visits with agricultural policymakers and political entities in Nepal.



Fig. 2. Districts visited by the author that included agricultural institutions of higher education, NARC, District Development Office and other agricultural enterprises.

In closing, Nepal’s agricultural research-teaching-extension sector is vibrant and active, but it requires significant amount of coordination amongst these entities. These institutions offer tremendous opportunities for collaborative linkages. Significant and tangible collaboration is possible with:

- Several NGOs/INGOs engaged in agricultural/cropping system research
- Nepal Agriculture Research Council
- Agriculture universities and colleges
- FORWARD, NCDC, Helvetas, FAO, World Bank, USAID
- Private industries (seed companies, beekeeping)

However, a collaborative mechanism needs to be developed by these institutions to attract international partners. An easy and sure way to begin such partnerships would be with Nepalese agricultural expatriates. Considering the ecological diversity and the numerous agencies (academic institutions, government agencies, NGOs and INGOs, and private industries) engaged in agricultural and ecological sustainability research and education in Nepal, one should easily find an area of interest and/or a party for an effective collaboration in Nepal.

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National Development: Opportunities and Challenges for the Diaspora
International Review and Example of Diaspora's Role in Nepal's Development

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Introduction

According to Merriam-Webster's Dictionary, Diaspora is "a group of people who live outside the area in which they had lived for a long time or in which their ancestors lived". Most literature states three major characteristics of the Diaspora: dispersion, homeland orientation and boundary (identity maintenance). Thus, although the original word Diaspora meant the dispersed Jews and Armenians, it is now a commonly used term for people who leave their ancestral lands and live somewhere else. In this paper, the word Diaspora is used in this general sense and includes people who have settled outside, and people who have intention to live outside their home country for an extended period of time.

As of 2014, more than three percent of the global population lives outside of their native lands, making the modern day Diaspora group an important part of the global population. Among the larger groups, the Chinese Diaspora number is estimated around 40 million, and Indian Diasporas globally is believed to be around 22 million. In total, the Diasporas send more than US\$ 500 billion annually (2013 estimate) to their original lands. The potential role of Diaspora in national development has become increasingly relevant and of immediate interest to national policy makers and international development agencies.

This paper provides a review of the status of global Diasporas from many native lands shows how they have become an important component of the national development equations. More and more international organizations have firmly established policies promoting the role of Diasporas as catalysts in the development of their native lands. Studies and anecdotal evidence suggest that Diasporas can be more effective as the professional in development programs.

A short case study of Nepali Diaspora and its developmental efforts on Nepal shows that when Diaspora groups mobilize themselves, and the native government offers support it can become a mutually beneficial strategy for development.

Emerging Views on Diaspora's Role in Development

Several international Institutions such as United Nations system, World Bank, regional development banks, academia, investment banks, and international businesses are recognizing the catalytic role of Diaspora in the development of their native lands. Solid evidence available for diaspora's role in development – reducing poverty, transferring skills

It is widely recognized that the native governments have not cashed on the potential of mobilizing the Diaspora as resources for development. Similarly, the donor agencies have traditionally ignored the potential role of the Diaspora groups in supporting the development of their respective native lands. The existence of the ready resource has remained a blind-spot for most donor agencies and the native governments for a long time. Fortunately, the bi-lateral and multilateral donor community has begun to appreciate the opportunity provided by the Diaspora groups as ready and available agents towards development. National governments have also begun to realize this readily available resource which can be used to their benefit.

It should also be noted that many concerns remain about a remittance-based economy of a country that may not be able to carry out a sustained development effort which is driven nationally. Examples of countries like Pakistan and Mexico are often provided as examples of countries which enjoy a large remittance inflow of cash, but have lacked in some nationally driven robust economic policies compared to some similar nations. The ready availability of remittance revenue often crowds out the urgent need to invest in domestic programs that can provide long term and indigenous revenue sources.

Why Diaspora in Development Field?

According to the Migration Policy Institute, "Diasporas can and, in many cases, do play an important role in economic development of countries of origin or ancestry. Beyond sending

remittances, they can also promote trade and foreign direct investment (FDI), create businesses and spur entrepreneurship and transfer know-how and skills.” The Diaspora groups know the culture and ground reality of their native lands more than the outsiders. In addition, the Diaspora groups have inherent networks inside the native land, which is a crucial element in making any development initiative successful. They possess a first-hand experience of the social, cultural and infrastructural circumstances in the native lands, a critical knowledge element required to design successful development programs. Most importantly, the Diaspora group has deep emotional reason to give back to the homelands which is motivated by some guilt of leaving the country, and by some altruistic motivation to help one’s own extended family, community members and people.

Some Examples of Diaspora Role in Development

Several countries such as Armenia, Israel, Taiwan, Korea, Ireland, China, and India are good examples of countries where their respective Diasporas played a key role in the national development. In all these countries the key areas of support provided by the Diaspora included:

- Sending remittance to buttress national economy
- Being catalyst agents for technology transfer
- Promoting international business and trade
- Organizing Foreign Direct Investment, for example the Non Resident Indians (NRI) invested approximately \$500 million in India during 1998-2001
- Returning Diaspora doing start-up companies and investing domestically. Example
Some 800,000 Chinese students returned home between 2008- and 2013 according China Daily USA (October 17, 2013) to China after studying in foreign countries each year
- Creating international network for trade, technology and business
- In 2013, top countries receiving remittances were India, China, Philippines, Mexico and Nepal (in terms of the percentage of GDP)
- Mexico, Mali and Philippines have 10% of their population abroad

Example of Nepali Diaspora

The Economic clout of Nepali Diaspora is significant. 10% of Nepal's population lives outside Nepal (excluding in India). Non-resident Nepali's remittances equal to 26% of Nepal's GDP (2013).

In terms of the GDP, the North American Diaspora alone rivals the GDP of entire Nepal. The following calculation by the author shows the annual GDP of North American Diaspora, Global Diaspora, their credit potential and estimate of the retirement and pension funds of the North American Nepali Diaspora. The total Nepali Diaspora community is estimated to be around 300,000 and their average per-capita income (2014) is conservatively estimated to be around US \$60,000.

- US/Canada: 300,000 (population) x \$60,000 (average GDP per capita) = \$18 billion annual GDP (US and Canada GDP/capita = \$52,500/yr - 2013)
- Worldwide: 3 million x \$15,000 = \$45 billion annual GDP
- Nepal GDP 2012 = US\$ 19 billion (World Bank)
- Retirement funds, North American Diaspora = 300,000 x 75,000 = \$225 billion

In 2003, the Nepali Diaspora formed a global organization – Non-resident Nepalis Association (NRNA) to represent the entire global Diaspora and bring them into one organizational umbrella. Since then, formally and informally, the NRNA has made significant technical, investment and philanthropic support to Nepal. In addition, NRNA is pushing for innovative ways to have more leverage for global investments. The NRNA also by edition includes the Nepali migrant workers in foreign lands including in the Gulf countries, Malaysia, Korea and other nations. The situation of the Nepali migrant workers is laden with many problems and is rampant. For example, the migrant labor in the Gulf countries and Malaysia work long hours, are paid a fraction of the wages paid for the same work done by the citizens of those countries. The working conditions are often harsh, and unsafe. 400 Nepali workers died in Qatar alone since 2011.

The Diaspora groups through NRNA have taken up several significant and far-reaching initiatives

to help in the socio-economic development of Nepal. But several challenges remain. For example, the good initiative on Open University of Nepal is still languishing in bureaucratic and political labyrinth of the Nepali governance system. The NRNA investments have so far created only a limited impact for the very large problems Nepal faces. The effectiveness of the NRNA is often discounted because of the high expectation of Nepalis of NRNA, and the rather limited product delivery of NRNA on the ground. NRNA as an organization has been fortunate to have several leaders of high caliber to lead the Association. However, problems remain in NRNA which include the limited entry of professionals and academics in the organizational leadership and the problems in financial sustainability of the secretariat.

Some Recommendations

Following are some recommendations to help in the mobilization of Diaspora groups to more effectively support the development of their native lands.

- Diaspora Associations should be strengthened, and made sustainable to help the Diaspora in development
- Home countries should work to establish research and mobilization services for Diaspora
- Host countries also should take due note on the value of Diaspora in their midst to help in the host countries' international development, trade and diplomatic efforts
- Host governments, native countries, and development organizations should formulate win-win programs to be developed where sentiments, emotions, intimate knowledge of the home turf and need for development converge
- Diaspora should be utilized to advance Economic Diplomacy for all concerned countries
- Approaching donors to promote Diaspora's involvement in native countries as consultants
- Establishing institutions and Foundations in-country and abroad for Diaspora welfare and mobilization. E.g., Gorkha welfare council in India

- The Diaspora association should be made into Self-sustaining organizations through innovate fund raising and investment mechanisms

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