

EVALUATION OF TOTAL ECONOMIC VALUE OF AYURVEDA MEDICINE WITH REFERENCE TO ENVIRONMENTAL VALUATION TECHNIQUES

De Silva R.H.S.K.*, Jayawardhane N.D.N., Narasimha Murthy K.H.H.V.S.S, Tripathi J.S.
Department of Kayachikitsa, IMS, BHU, Varanasi, India

Article Received on: 12/06/11 Revised on: 14/07/11 Approved for publication: 18/08/11

*E mail: dr.himaleee@gmail.com

ABSTRACT

Ayurveda is one of the oldest medical systems in the world. Health is a state of equilibrium of Physical, Psychological and Spiritual components. This equilibrium is maintained between internal and external environment which is known as Loka Purusa Samya. Ayurvedic therapeutics uses herbs and minerals extracted from environment to maintain the well being of human being. Universally this unique feature ensured sustainable utilization of both environmental and Ayurvedic principles in providing health care. Recently, mankind's attitude towards the environment has changed with new concepts such as Sustainable Development, Cleaner Production Technology and Environmental Valuation Techniques etc; Increased knowledge and awareness of environmental goods & services, global attention is oriented towards Ayurvedic Medicine.

Due to this resurgence, economic value of Ayurvedic Medicine in the global market is at a peak level. Our focus is on the evaluation of Total Economic Value (TEV) of Ayurvedic Medicine with reference to Environmental Valuation Techniques (EVT). Revealed Preference (RP) and Stated Preference (SP) EVT are clearly described. Some critical points of Hedonic Pricing, Travel Cost and Benefit Transfer Methods of RP and Contingent Valuation and Choice modeling Methods of SP were outlined with demonstrative examples related to Ayurveda according to their markets. This paper will be helpful to identify the TEV of Ayurvedic Medicine. Moreover, it explores a new area of study for further research and development to overcome the issues relating to globalization of Ayurveda.

KEY WORDS: Ayurveda, Environmental Valuation Techniques, Total Economic Value, Revealed Preference Methods, Stated Preference Methods, Markets

INTRODUCTION

Ayurveda is one of the oldest medical systems in the world. It based on unique fundamental principles which were nourished by Indian philosophies. According to Ayurveda, Health is a state of equilibrium of Physical, Psychological and Spiritual components. This equilibrium is maintained between internal and external environment which is known as Loka Purusa Samya. The theory of Loka Purusha Samya (Macrosom-Microsom Continuum) is one of the important principles of Ayurveda with special reference to Environmental Economics.^{1, 2, 3} The individual and the universe remain in constant interaction with each other. If this interaction in dynamic equilibrium components of health can be maintain. If not it leads to manifestation of diseases. For prevention as well as for curative purposes Ayurvedic therapeutics using herbs, herbo- minerals and minerals extracted from environment to maintain the well being of human being. This unique feature ensured sustainable utilization of Ayurvedic principles in providing health care universally. Most recently, mankind's attitude towards the environment has evolved to encompass different kinds of new concepts such as

Sustainable Development, Cleaner Production Technology and Environmental Management System etc; But the theory behind these concepts are not new for East, especially for South East Asian countries. They have maintained best equilibrium with the eco system starting with primitive times.^{4,5}

In this context, the world is currently paid much more attention on Ayurveda because it based on the laws of nature. As a result, it expanded globally and gained popularity in 21st century. Due to this increased public awareness of and knowledge about them can increase the Total Economic Value. But markets are still not well developed for many environmental goods and services like Ayurvedic Medicine. Therefore it is necessary to consider Environmental Valuation Techniques in Ayurvedic Medicine.

MATERIALS AND METHOD

Theoretical aspects of Economic and Environmental Valuation Techniques were referred. Health care markets as well as markets for environmental goods and services also considered. Components of the Total Economic Value and types of Environmental Valuation Techniques

are outlined with demonstrative examples in relation to Ayurvedic Medicine.

RESULTS AND DISCUSSION

The complete article has been discussed in following subtopics: Economic valuation and Health care System, Values of Environment and Ayurveda, Environmental Valuation Techniques and Total Economic Value of Ayurveda

Economic Valuation and Health Care System

Economics is basically a science of marginal changes in a few percent in supply or demand, or in price or income. Economic evaluation is the comparison of two or more alternative courses of action in terms of both their costs and consequences.^{6,7,13} Economists usually distinguish several types of economic evaluation, differing in how consequences are measured. But there are factors that distinguish health economics from other areas include extensive government intervention, intractable uncertainty in several dimensions, asymmetric information, and externalities. Governments tend to regulate the health care industry heavily and also tend to be the largest payer within the market. Uncertainty is intrinsic to health, both in patient outcomes and financial concerns. The knowledge gap that exists between a physician and a patient creates a situation of distinct advantage for the physician, which is called asymmetric information. Externalities arise frequently when considering health and health care, notably in the context of infectious disease. For example, making an effort to avoid catching the common cold affects people other than the decision maker.^{7,8,9,10,11,12}

The demand for health care is a derived demand from the demand for health. The demand for health is unlike most other goods because individuals allocate resources in order to both consume and produce health. There are different types of health care markets. Typically analyzed five health markets are : Health care financing market, Physician and nurses services market, Institutional services market, Input factors market, Professional education market. And following methods are using with issues related to scarcity in the allocation of health and health care.

1. Cost-Minimization Analysis – (CMA) The effectiveness of the comparators in question must be proven to be equivalent. The cost-effective comparator is simply the one which costs less as it achieves the same outcome.

2. Cost Benefit Analysis - (CBA), both costs and benefits are valued in cash terms.

3. Cost-Effectiveness Analysis- (CEA) measures outcomes in natural units, such as mmHg, symptom free days and life years gained.

4. Cost-Utility Analysis - (CUA) measures outcomes in a composite metric of both length and quality of life, the Quality- Adjusted Life Year (QALY).

5. Cost of illness study - This is not a true economic evaluation as it does not compare the costs and outcomes of alternative courses of action. Instead, it attempts to measure all the costs associated with a particular disease or condition. These will include direct costs where money actually changes hands, e.g. health service use, patient co-payments and out of pocket expenses, indirect costs the value of lost productivity from time off work due to illness, and intangible costs the disvalue to an individual of pain and suffering.¹³⁻¹⁷

All these Economic valuation methods handle small and marginal changes well. But have problems when the changes are large and non-marginal. Issues like global warming, mass extinctions, or dramatic climate changes have to be handled carefully instead of merely extrapolating from results based on small changes^{13,18}. This will require new studies, where large changes are explicitly described to respondents and then valued. Economic valuation of non-marginal changes in the field of Ayurveda also will become an important new area for applied methodological research by experts in both Ayurveda and economic fields. Further when considering Ayurveda as a health care system its total outlook is extremely different due to its unique features. As a result above mentioned economic valuation methods may not give the correct value and health markets may not properly use. Ayurveda by its means is an eco friendly and bio friendly medical system hence it is an environmental good and service.¹⁻³

Total Economic Value and Ayurveda

The environment is an instrument to achieve human satisfaction. In turn, environment can be treated like any other commodity and its associated value can be broken down into many elements. Total economic value, is a useful concept which explicitly recognizes that the economic value of an environmental good or service^{13,19-22}. It is composed of different parts, represented by the following equation:

Total Economic Value = Direct value + Indirect Value + Non Use Value + Intrinsic Value

Ayurveda also can be considered as an instrument to which achieve human satisfaction broadly known as Sukhayu and Hitayu if not satisfied suffered from Dukhayu and Ahitayu.^{1,2} When estimating the total

economic value of the Ayurveda above components should be considered.

There are many ways to categorize the values attached to the environment. Basically they are to identify benefits from the environment that neither are nor properly reflected in the monetary value. For example the value of coastal area could be theoretically quantified based on the values of the products (Direct use values) it offers such as fish, crabs, recreation and bird watching etc; other than use values, non use values and intrinsic values are associated with the coastal area.^{23, 24}

Use Values

Use values include direct use value and indirect use value.^{19, 24, 25}

The Direct Use Value

The direct use value concerning actual use of a resource for either Commercial purpose such as edible, ornamental, medicinal, inputs into production process, Recreation, Waste assimilation, Research and Education.^{19, 24, 25, 26}

As an example fishing, hiking are direct use values of coastal area. Using Ayurveda medicines for treatment and cure of diseases, Ayurveda Education and research are direct use values of Ayurveda.

Indirect Use Value

Indirect use value means society's benefits from ecosystem functions such as biological support links to other species and habitats, physical protection & defense function, climate regulation, global life support functions that aid in supporting life on Earth.^{19, 24, 25, 26}

Considering Ayurveda as a Primary health care system it has links to other species and habitats like Gajayurveda (concerning elephants), Vrukshayurveda (concerning plants), Pushpayurveda (concerning flowers) etc; and its theories and approaches have coherent relation among culture, religion and society which helpful to inculcate human values indirectly supporting life on earth.

Non Use Value

Non use values are less direct and less tangible benefits to society and include mainly option value and existence value.^{19, 24, 25, 26}

The Option Value

The option value is the value an individual places on the potential future use of the resource, or individual's willingness to pay for the option of using a resource in the future. And it is the assessment of value attached to an option that would be available in the future.

For example, Benefits of a beach would offer future trips to the coastal area, Bio diversity is lost at the expense of development; the possibility of benefitting from it is gone for ever.^{19, 24, 25, 26} Recently developed

environmental related concepts such as Sustainable Development, Environmental Management System, and Cleaner Production etc; are based on potential future use. All these concepts are clearly explained in Ayurveda in different terms.

Further, National and International level seminars, research in various aspects indirectly enhanced the potential future use of Ayurveda in next generation. Due to development of modern biomedical related sciences the possibility of benefitting from Ayurveda has gone for ever in some fields such as Surgery, infectious diseases etc; But the healing potential of Ayurveda has opened up a new front of health tourism in India – Kerala, Sri Lanka etc; where people all over the world come for availing the benefits of Ayurveda therapy for many chronic ailments and also for diseases. Eco tourism or Nature tourism is well nourished by the option value of the Ayurveda.

Existence Value

Existence values which reflect the fact that people value resources for moral reasons, unrelated to current or future use. For example, existence of natural habits of grizzly bears may be considered be valuable, though people do not necessarily want an encounter with the bears in the wild.^{19, 24, 25, 26}

Keeping this view in mind the existence of world one of the oldest medical systems, Ayurveda, considered to be valuable unrelated to current use or future use.

This value includes Bequest value, Stewardship value and Benevolence motives.

Bequest Value

Bequest value which reflects people's willingness to pay to ensure that their heirs will be able to use a natural resource in the future and it is the satisfaction gained from through the ability of to endow a natural resource on future generation. For example, preserving a national park may benefit for future generations; although not everybody of present generation has intention to visit the park. Conservation and preservation of historical archaeological sites, monuments, and medicinal plants etc; for future generation can be highlighted.^{19, 24, 25}

Plant Sanjivane (Salleginella bryopteis?) has high historical value related to famous Ramayana story which was used as Central Nervous System Stimulant and as a cognitive enhancer during Dvapara Yuga and also it was mentioned in main source books of Ayurveda too. Conservation and preservation of this plant benefit for future generation.

Stewardship Value

Stewardship value is derived from an altruistic sense of responsibility toward the preservation of the environment

and desire to reduce environmental degradation.^{19,24-27} Again this value emphasizes the preservation of the world one of the oldest medical system, Ayurveda.

Benevolence Motive

The benevolence motive reflects the desire to conserve an environmental resource for potential use by others. For example, some people may value the existence of a diverse set of species, regardless of the effect of the loss of a species on ecosystem services. The existence of these species may have an option value, as there may be possibility of using it for some human purpose such as certain plants may be researched for drugs. Moreover individuals may value the ability to leave a pristine environment to their children.^{19, 24,25,26,27}

Some plants mentioned in Red Data list or in endangered species are using as Ayurvedic medicines. And herbomineral and mineral drugs which their contents are not easily available in the nature but have high effectiveness. eg; Swarna Bhasma (Ash of Gold). But without concerning the existence all these herbs and minerals still they are using for human well being. These can be highlighted as benevolence motive of Ayurveda. Finally, the intrinsic value of nature reflects the belief that all living organisms are valuable regardless of the monetary value placed on them by society.^{19,24,25,26,27}

Therefore not only as one of the oldest medical system but also as an applied philosophy, Ayurveda has an intrinsic value regardless of monetary value.

Environmental Valuation Techniques and Ayurveda

Nowadays, several techniques are available for environmental valuations which differ in data requirements, assumptions regarding economic agents, and values that they are able to capture. Broadly speaking, valuation techniques are divided into the following two categories: the Non-demand (market price) methods and Demand curve approaches.^{19,20}

Non Demand Method

In the non-demand category, the most commonly used techniques are the replacement cost, the damage avoided cost, the substitute or alternative cost, and the productivity change cost. These methods are based on the cost of replacing environmental services or the cost of avoiding damages, the cost of providing substitute services and the cost incurred due to changes in productivity. The principal assumption of these methods is that if people incur costs to avoid damages caused by lost environmental services or to replace the services of ecosystems, then those services are worth at least what people have paid to replace them. Some examples where these methods might be applied include the following:

1. Valuing land destruction by estimating the restoration cost.
2. Valuing improved water quality by measuring the cost of filtering & chemically treating water.
3. Valuing noise pollution by determining the cost of control measures.

Although non-demand approaches can easily be applied, economic theory shows that the full value of a good can only be estimated by examining the demand curve, which shows how much of the good people would use at varying prices. But in the majority of cases, non-demand curve approaches are unable to capture the true value of the ecosystem. Therefore, demand curve techniques should be employed, although they are more complex and costly to apply.^{11,13,17,19-21,28}

Demand Curve Approaches

In demand curve approaches environmental valuation techniques are primarily driven by the principle that individuals are self-interested and demonstrate preferences that form the basis of market interactions. These market interactions demonstrate how individuals value environmental goods and services. The market-based nature of economic theory emphasizes the maximization of human welfare. The market, in turn, determines resource allocation based on the forces of supply and demand. Demand curve approaches are divided to Direct and Indirect approaches.^{11,13,17,19-22, 28}

Direct approaches also known as State Preference Methods, apply for non markets based which include techniques that attempt to elicit individuals' preferences directly by means of social surveys. Contingent Valuation and Choice Experiments methods are direct approaches which useful to measure the non use value of the environmental resources. The most important of these techniques is the Contingent Valuation Method, which is by far the most popular, since it is able to measure Total Economic Value of environmental goods and services^{11,13,17,19-22,28}

Indirect approaches, also referred to as Revealed Preference Methods, elicit preferences from the actual behaviour of individuals, based on market information. Revealed preference approaches make use of individuals' behaviour in actual or simulated markets to infer the value of an environmental good or service. For example, the value of a wilderness area may be inferred by expenditures that recreationists incur to travel to the area. Generally, two types of markets identified to apply to this type of valuation: Market Based and Surrogate Markets. Moreover, factor of production, producer/consumer surplus and defensive expenditure are three market based techniques and hedonic pricing,

travel cost and benefit transfer methods are surrogate market techniques.^{11,13,17,19-22,28}

Direct- Stated or Expressed Preference Approaches – Non Market Based

This method elicited individual's preferences directly by means of social surveys.

The Contingent Valuation Method (CVM)

This is a non-market-based technique that elicits information concerning environmental preferences from individuals through the use of surveys, questionnaires, and interviews. When deploying the contingent valuation method, the examiner constructs a scenario or hypothetical market involving an improvement or decline in environmental quality. The scenario is then posed to a random sample of the population to estimate their willingness to pay e.g., through local property taxes or utility fees, for the improvement or their willingness to accept monetary compensation for the decline in environmental quality. The questionnaire may take the form of a simple open-ended question e.g., how much would you be willing to pay, or may involve a bidding process e.g., would you accept Rs10, would you accept Rs20, or take-it-or-leave-it propositions. Based on survey responses, examiners estimate the mean and median willingness to pay (WTP) for an environmental improvement or willingness to accept (WTA) compensation for a decline in environmental quality. Calculate the sum value multiplying the mean or median WTP by the total units of the population.

Illustrative environmental applications of CVM include: air and water quality, outdoor recreation, reduced risks from drinking water and groundwater contaminants, protection of wetlands, wilderness areas, endangered species, and cultural heritage sites.

CVM is a widely accepted and well-established method, since it offers certain advantages.

1. It is very flexible and can be used in estimating the economic value of a variety of environmental assets.
2. It is the most widely accepted method for estimating total economic value.
3. Environmental goods and services that are clearly understood by the respondents can easily be estimated, even if there is no observable behaviour available to deduce values by other means. The vast majority of CVM studies have been undertaken for assisting in decision-making procedures.

The primary disadvantage of CVM is that it may not yield accurate results due to biases that may be introduced in the survey or through respondents' behavior.

These biases include:

1. Information bias – CVM assumes that people understand the good in question and will reveal their preferences in the contingent market as they would in a real market.
2. Strategic bias- Individuals may provide answers in order to direct the surveys at specific results. Hence, they may state lower or higher prices, expecting particular benefits.
3. Hypothetical bias – It is argued that there is a fundamental difference in the way people make hypothetical decisions in comparison with the way they make actual decisions. Hence, since respondents do not actually pay for the proposal action.
4. Payment bias – The proposed method of payment influences the respondent's statement. For example, some people may value the good, but state that they are not willing to pay for it, because they are protesting some aspect of the scenario, such as increased taxes.
5. Part-Whole bias: In many cases where people are first asked for their WTP for one part of an environmental asset e.g. a part of a National Park, and then asked to value the whole asset e.g. the whole National Park, the amounts stated are found to be similar. This phenomenon seems to lie in how people allocate their spending
6. WTP vs. WTA: The payment question can either be phrased as "What are you willing to pay to receive this environmental asset?" or as "What are you willing to accept in compensation for giving up this environmental asset?"

To minimize bias, analysts must be extremely careful in how they design surveys and conduct interviews. An extensive body of economic literature addresses the sources of inaccuracy in CVM studies and the development of methods to deal with specific issues of survey design and implementation. Nowadays, a great deal of research is being conducted to improve the methodology and to make the results more valid and reliable. Contingent valuation studies are focused on valuing specific changes in environmental conditions. Thus, individuals who are surveyed in CV studies are typically presented with a specific program or action and asked to value it in its entirety.^{11,13,17,19-21,27, 28, 29}

During last two decades, due to holistic approach of Ayurveda, using lifestyle modification measures, healthy diet and safer natural drugs etc, attract a large population in different countries around the world. Today, Ayurveda and Chinese Medicine top the list of Traditional Medical therapies in popularity across the globe. Ayurveda is identified as a best holistic health care system for wellness, integrating the mind-body-spirit trio. Hence

CVM encountered this non use and intrinsic value of Ayurveda as an environmental good and service. In Ayurvedic Pharmaceutics where Ayurveda drugs are marketed and propagated as nutraceuticals, food supplements, cosmetics, rejuvenatives and aphrodisiacs. This direct use value of Ayurveda is one of the major problems in most of the countries because Ayurveda drugs can be seen in General stores as dietary supplements under the label of Ayurvedic Herbal products. However people are more oriented towards Ayurvedic medicine due to awareness about adverse effects of allopathic medicines. But the actual economic value of green pharmaceuticals of Ayurveda not properly valued. If we used CVM correct value will be obtained for Ayurvedic drugs. The promotion of Ayurveda education in many parts of the world is doing without expressive the actual knowledge of the word Ayurveda. Ayurveda is studied from different angles such as purely academic approach to study Ayurveda, an exercise in which medical anthropologists, historians, philologists and Sanskritists are engaged or for medical purposes. All these use and non use values are valued correctly will resolve the identity crisis facing by Ayurveda Medicine among medical world.^{3, 39, 31, 32}

Choice Experiment Method

In Choice Experiment method respondents are presented with a menu of alternatives relative to environmental policy options, such that preferences for various components or attributes can be examined at a more refined level. Whereas CVM produces a single value for a change in environmental quality, choice experiments provide independent values for the individual attributes of an environmental program. It provides the analyst with a more complete understanding of individual preferences. This method can be used to value the BAMS, MD, PhD and other undergraduate and post graduate courses conducting in different universities when these courses are offering to national and foreign students according to their preferences.^{11,13,17,19-22,27-29}

Indirect – Revealed Preference Approaches - Market Based

This method elicits preferences from the actual behaviour of individuals based on marked information. Economists generally prefer to rely on direct and observable market interactions to place monetary values on goods and services. Markets enable economists to measure an individual's willingness to pay to acquire or preserve environmental services. In turn, consumers reveal their preferences through the choices they make in allocating scarce resources among competing alternatives. There are a number of market-based

methods of environmental valuation. Main three market-based techniques are:

1. Factor of production Approach,
2. Change in producer/consumer surplus, and
3. Examination of Defensive Expenditures

Factor of Production Approach

The value of a natural resource can be monetized based on its value as a factor of production. When a natural resource has direct value as a factor of production and the impact of environmental degradation on future output of that resource can be accurately measured, the resultant monetary value of the decline in production or higher cost of production can be measured. For an example, a decline in water quality could have a direct and detrimental impact on the productivity and health of shellfish beds. This technique is methodologically straightforward; however, it is limited to those resources that are used in the production process of goods and services sold in markets. Because many goods and services produced by the environment are not sold in markets, the factor of production method generally fails to capture the total value of the resource to society^{11,13,17,19-22,27-29,33}

Keeping all these points in view, some of the Ayurvedic goods and services are not sold in the market. But this method can be use to measure accurately the impact on future output of Ayurveda based on the factor of production. The output of Ayurveda is a function of several inputs such as graduates and post graduates passed out per year, availability of herbs and minerals for preparation of drugs, overcome the new challengers in disease management and prevention such as AIDS, SARS, Chikungunya and Cancer etc; But it is unable to capture the Total Economic Value of Ayurveda.

Change in Producer/Consumer Surplus

This is the standard method used to measure the net economic benefit of a good or service in a market involves an examination of consumer and producer surplus.

Consumer surplus is the difference between what each customer is willing to pay and the price of the good or service and it is represented by the above the price line and below the demand curve. Producer surplus is the difference between what a producer is paid for a good or service and what it costs to supply. The total economic benefit of a sale is the sum of the consumer and producer surplus.^{11,13,17,19-22,27-29,33-36}

In the process of globalization, Ayurvedic Medicine has best consumer surplus. Therefore this can be used to measure the total economic benefit of Ayurveda in the market. **Fig.1. demand, supply market**²⁰

Examination of Defensive Expenditures

A final market-based valuation method is that of defensive expenditures, which are made on the part of industry and the public either to prevent or counteract the adverse effects of pollution or other environmental stressors. The defensive expenditures method, also known as the averting behavior approach, monetizes an environmental externality by measuring the resources expended to avoid its negative impacts on a surrounding community. Types of defensive expenditures include water purification devices, beach nourishment, and replanting sea grasses. In the field of Ayurveda this method is specially benefited for pharmaceutical industry because they used several measures to avoid negative effects purify the toxic herbo mineral drugs, special measures for adulteration and substitutes. ^{11,13,17,19-22,27-29,33-36}

Surrogate Market Methods

In the absence of clearly defined markets, the value of environmental resources can be derived from information acquired through surrogate markets. The most common markets used as surrogates when monetizing environmental resources are those for property and labor. The surrogate market methods discussed below are the hedonic price method and the travel cost method. ^{11,13,17,19-22,27-29,33-35}

Travel Cost Method

The travel cost method (TCM) is employed to measure the value of a recreational site by surveying travelers on the economic costs they incur e.g., time and out-of-pocket travel expenses, when visiting the site from some distance away. These expenditures are considered an indicator of society's willingness to pay for access to the recreational benefits provided by the site. The travel cost method can be used to measure not only the elimination of a site but also the impact of access restrictions and changes in environmental quality. The travel cost method, however is limited in application and captures only direct recreational benefits and only when there are measurable travel costs to examine. Finally, the travel cost method does not measure non-use and intrinsic values or other sources of value, such as commercial values.

Using a number of observations, a demand curve can be obtained and the value of the site can be estimated. The raw materials for TCM analyses are individuals' travel costs and a number of parameters that must also be taken into account.

The first step involved with the TCM is the creation of a trip-generating function in order to provide a model of

site's use. There are two basic forms of functions, namely Zonal TCM (ZTCM) and Individual TCM (ITCM).

In ZTCM, visitors are grouped into zones of origin and a demand function is estimated from the statistical relationship between the aggregate trips from a zone and the cost of travel. But in the ITCM, values are derived from the individual's total trips and the distance that individual travels. The type of function determines the dependent variable, which is either the number of trips made by inhabitants of a given geographical zone or the number of trips made by individuals. In either case, the independent variables describe the cost of travel e.g. on-site costs, fuel, tolls, etc; socio-economic characteristics of visitors such as income, education, age, gender, etc; and characteristics of the site, substitute sites, travel time and others. There is no commonly accepted formula for the independent variables to include. Everything that affects the dependent variable should be included, without harming the statistical integrity of the function. In practice, however, both statistical problems and theoretical issues arise. The trip-generating function is statistically determined by means of multiple regression analysis. Then, this function is used in order to derive the relationship between visits and the price of admission, which is also referred to as surrogate demand curve. Once the demand curve has been established, the consumer surplus can be estimated, which is the total area below the demand curve given that, in fact, the price for entering the site is zero.

However, the method faces some difficulties, such as the following:

1. It raises serious debates as far as the treatment of travel time is concerned. Empirical evidences show that decisions about recreation are based not just on the cost of travel but also on the availability of time. A usual approach is to value time at a fixed percentage of the wage rate.
2. The alternative choices of visitors as well as the allocation of travel costs in the case of multipurpose trips may bias the results with respect to the recreation value of the site
3. In many cases, the value of the site is underestimated due to "zero cost" visitors e.g. children, elderly people, etc., who usually travel with other members of their families.
4. The method is inapplicable when prospective changes in environmental quality are to be measured. ^{11,13,17,19-22,27-29,33-36}

Nevertheless, the method remains, for practical reasons, one of the most popular approaches for environmental valuation and is frequently used by government agencies.

This method can be used to value the packages which include Ayurveda in Ecotourism or Nature tourism.

Hedonic Pricing Method

The hedonic price method of environmental valuation uses surrogate markets for placing a value on environmental quality. It is based on the assumption that environmental attributes influence an individual's decision on the consumption of the commodity, such as buying or selling a house. Air, water, and noise pollution have a direct impact on property values. Hedonic models have been used in a variety of applications, such as: clean air, proximity to green areas, to view lakes and forests, and noise levels. The theoretical framework of the method is simple. Dwelling prices differ with respect to:

1. Housing characteristics- square footage of the home, number of rooms and quality of accommodation
2. Neighbourhood characteristics- level and quality of social infrastructure, housing density, traffic, and presence of other facilities
3. The quality of the environment - air pollution, noise level, view

Other characteristics being equal, it would be reasonable to expect that properties in areas with better environmental quality enjoy higher prices. Hence, if data on such characteristics are available, it is possible to isolate the contribution of the environmental factor to the market price of a house by means of econometric techniques. In order to apply the method, data must first be collected on residential property sales in the region under investigation for a specific time period. The data required are as follows:

1. Transaction price and location of dwellings,
2. Property characteristics, such as number and size of rooms, and lot size,
3. Neighbourhood characteristics and accessibility, such as crime rates, distance to shopping centers and availability of public transportation and
4. Environmental characteristics in question.

Once the data are collected, the next step is to statistically estimate the hedonic function that relates property values to these characteristics by means of multiple regression analysis. It measures the portion (i.e. the partial derivative) of the property price that is attributable to each characteristic. Hence, the value of the environmental asset can be estimated by the partial derivative, which is the implicit marginal attribute price. It is then possible to trace back the inverse demand function based on the implicit marginal price function with respect to certain environmental quality changes.

Although the principal concept is simple but there are serious difficulties and limitations with applying the method into practice. First, extensive cross-section data, time series data or a mixture of both should be used. Gathering a suitable data set can be time consuming, expensive and in some cases impossible, since data are not always available. Second, given that a property value function depends on many variables, in order to measure their impact on the price, they must all be included in the regression model. Nevertheless, in many cases due to data unavailability, some explanatory variables are omitted. On the other hand, when a hedonistic function contains a large number of variables, multi co-linearity may undermine the results. The form of the hedonic model cannot be specified on purely theoretical grounds and must be determined empirically and the results are highly sensitive to model specification and level of disaggregation. The temporal stability of hedonistic value equations should also be considered, especially when housing markets receive significant shocks over a given time period. Problems also originate from market distortions, which exist in many countries. Finally, hedonistic studies cannot be easily applied when potential changes in environmental quality are investigated.^{11,13,17,19-22,27-29,33-36} This method can be used to estimate when the people's willingness to pay for best quality Ayurvedic services. For an example, when offering Ayurvedic education or services for other countries higher academic qualification, teaching, learning and research qualifications etc; of the resource person should be considered.

Benefit Transfer Method

In general, original environmental valuation studies are expansive and time consuming and, in the majority of cases, resources in terms of time and money are barely available. The latter has resulted in adopting the use of the benefit transfer method (BTM), which refers to the application of the results obtained from a particular case to another area. The site of the original research is usually called "study site", while the site to which the benefit estimate is transferred is called "policy site". This process is a cost-effective way to evaluate the environmental effects of projects when original research is not possible due to budget constrains and/or time limitations. In any case, primary research is the first-best strategy. However, when primary research cannot be carried out, BTM provides useful information for decision making, especially in cases where a high degree of precision is not critical.

Several necessary conditions should be met to perform effective and efficient BTMs, including: studies

transferred must be based on adequate data, sound economic methods and correct empirical techniques and the environmental resource and the change in quality reflected in policy should be similar to the study sites. Several factors may also affect the reliability and validity of this method, including the quality of the original study, the different research methods that may have been used for data collection, the different statistical methods that may have been applied for estimating models and the issue of temporality or stability of data over time, since the existing studies occurred at different points in time.

There are two broad approaches to BTM: (a) value transfer and (b) function transfer. Value transfers encompass the transfer of a single or point estimate from a study site or a measure of central tendency of the estimates from several study sites (such as an average value). Function transfers encompass the transfer of a benefit or demand function from a study site or a meta-regression analysis function derived from several study sites. Function transfers then adapt the function to fit the specifics of the policy site, such as socio-economic characteristics, the extent of the market and environmental impacts, and other measurable characteristics that systematically differ between the study site(s) and the policy site. If suitable functional relations and parameters are available, then a functional transfer can be more useful in revealing the dose-response relationship and provide valuable information on the impact of a change on one variable. ^{11,13,17,19-22,27-29,33-37}

However, as the functions obtained from TCM, HPM and CVM studies often have low coefficients, the transfer of such functions can lead to further uncertainties. In this case, the transfer of unit value can be more manageable, as it can be adjusted as necessary. Recent studies have tested the validity and reliability of different BT methods.

CONCLUSION

Due to globalization as well as environmental oriented concepts have already affected the Ayurvedic medicine, at least on two important factors namely eco pharmacy and holistic approach. At the same time environmental valuation has been rapidly developed because protecting human health is a primary goal of environmental policy. Environmental goods such as air, water etc; and environmental services like cleaning air and water, Ayurveda also have many assets of environmental goods and services. But the familiarity of the Ayurvedic Medicine with environmental economics remains limited. However, it is more than evident that due to the

potentially significant legal and financial risks involved, Ayurvedic authorities should fully understand and implement environmental valuation processes in the near future.

Ayurvedic experts, as well as decision makers involved in issues related to Ayurveda, should always bear in mind that Ayurveda is an environmental good and service when valuing Ayurvedic assets.

This is an initial attempt to identify the use and non use values of Ayurveda and relevant markets as well as find out the corresponding valuation techniques for Ayurvedic assets. The accuracy of economic valuation is dependent on the scientific identification and quantification of change in Ayurvedic field and the estimation of people's preferences for or against this change. Nevertheless, some values may seriously be affected by the assumptions made and/ or the method used as well as theoretical and practical complexities. Valuation of Ayurveda as an environmental asset by means of primary studies is in general, time and cost consuming. But studies related to Total Economic Value of Ayurveda are timely needed.

REFERENCES

1. Singh RH. The Holistic Principles of Ayurvedic Medicine, Chaukhambha Sanskrit Pratisthan, Delhi, 2003.
2. Singh RH. Body- Mind - Spirit, Integrative Medicine in Ayurveda, Yoga, Nature cure, Chaukhambha Sanskrit Prakashan, Varanasi, 2009.
3. Singh RH. Globalization of Ayurveda: Challenges and Opportunities, 4th National Seminar, Ayurveda in 21st Century, Introspection and Prospects, Desh Bhagat Ayurvedic College and Hospital, Mandi Gobindgarh (Pb), 2010: 1-6.
4. Santra SC. Environmental Science, New Central Book Agency (P) LTD, Delhi, 2005.
5. Botkin DB, Kelleer EA. Environmental Science, Earth as a Living Planet, John Wiley and Sons, Canada, 1995.
6. Rajalakshmi N. Environmental Cost of Economic Evaluation, Manak Publications PVT Ltd, 2002.
7. Hussen MA. Principles of Environmental Economics, Economics, Ecology and Public Policy, London and New York, 2000.
8. Markandya A, Ortiz RA. General Introduction to Valuation of Human Health Risks, Encyclopedia of Environmental Health, 2011: 871- 878.
9. Reddy VR. Economic Analysis of Health Impacts in Developing Countries, Livelihoods and Natural Resource Management Institute, Hyderabad, AP, India, 2000: 197 –206.
10. Bloom G, Standing H, Liloyd R. Markets, Information Asymmetry and Health Care Towards New Social Contracts, Social Science and Medicine 2008; 66 (10): 2076 – 2087.
11. Dickie M, List J. Economic Valuation of Health for Environmental Policy: Comparing Alternative Approaches. Introduction and Overview, Environmental & Resource Economics 2006; 34:339–346.
12. Guar S, Chandrashekara T. Global Environmental Crises, Hazards and Risk Management, Book Enclave, India, 2006.

13. Wikipedia.org [home Page on the Internet],The Free Encyclopedia, Ecological Economics; HealthCare Markets [updated 2010 Nov. 13, cited 2010 Dec 31] Available from: http://www.en.wikipedia.org/wiki/Ecological_econ.
14. Hancey N, Romerts CJ. Recent Advances in Environmental Economics, Blackwell Publishing Company,UK, 2002.
15. Rajalakshmi N. Environmental and Economic Development, Manak Publications Pvt, Ltd, 2004.
16. Bose DK. Essays on Environmental Economics, KP Bagchi and Company, Kolkata, 2004.
17. Edwards PJ, Abivardi C. The Value of Biodiversity, Where Ecology and Economy Blend, Biological Conservation 1998; 83(3): 239- 246.
18. Agrawal SK. Environmental Scenario for 21st century, A.P.H. Publishing Corporation, India, 2010.
19. Dixon John A. Environmental Valuation: Challenges and Practices A Personal View, Economics and Conservation in the Tropics: A Strategic Dialogue, 2008.
20. Escap Virtual Conference [home page on the Internet]. Integrating environmental considerations into economic policy making processes, method of assessing the effectiveness of policies/ measures [cited 2010 Dec 13]. Available from: http://www.unescap.org/drpad/vc/orientation/M5_7.htm.
21. Plottu E. The Concept of Total Economic Value of Environment Hierarchical Rationality, Ecological Economics 2007; 61(1): 52 – 61.
22. Jones L, Mulder I. Valuing Nature: The Economics of Biodiversity, Journal for Nature Conservation 2009; 17(4) : 245-247.
23. Kumar A, Roy PK. Environmental Issues and Solutions, Daya Publishing House, India, 2008.
24. Joshi MV. Theories and Approaches of Environmental Economic, Atlantic Publishers and Distributors, India, 2004.
25. Charles DK. Environmental Economics, Oxford University Press, New York 2000.
26. Paul R, Armsworth B, Kendall E, Davis FW. An Introduction to Biodiversity Concepts for Environmental Economists, Resource and Energy Economics 2004; 26(2): 115-136.
27. Mukherjee B. Fundamentals of Environmental Biology, Silver Line Publications, India, 2008.
28. Edwin S, Mills WN. The Economics of Environmental Quality, Norton and Company, New York, 1987.
29. Kumar A, Environmental Challengers of the 21st Century, A.P.H. Publishing Co operation, India, 2003.
30. Baghel MS. Issues in Publication of Ayurvedic Research Work – National & International Scenario – Shortcomings & Solutions. [cited on 2010 Dec 24] Available from: <http://www.serveveda.org/documents/MS%20%20bagel.pdf>.
31. Patel P. Global Resurgence and International Recognition of Ayurveda. [Cited 2010 Dec28]. Available from:<http://herbalnet.healthrepository.org/bitstream/123456789/2075/13/10.%20Ayur>.
32. Karanjot KB. Green Revolution- Ecological Implications, Dominant Publishers and Distributors, India, 1999.
33. Singh AK. Environment and Development, Adhyayan Publishers and Distributors, India, 2006.
34. Ghosh A. Environmental Issues and Concerns, A.P.H. Publishing Co Operation, India, 2007.
35. Shukla SK, Srivastave PR. Assessment of Analysis of Environmental Management, Commonwealth Publishers, India, 1992.
36. Gupta DSP. Environmental Issues for the 21st Century, Mittal Publications, India, 2003.
37. Gomez E, Lomes B, De Groot R, Pedro L, Montes C. The History of Ecosystem Services in Economic Theory and Practice: From Early Notions to market and Payment Schemes, Ecological Economics 2010; 69(6): 1209-1218 .

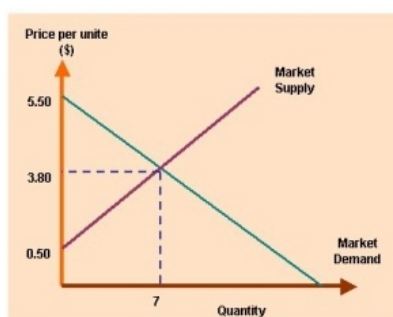


Fig.1. demand, supply market

Source of support: Nil, Conflict of interest: None Declared