CEPA Fair

Framework on Estimating Expected Benefits through Facilitating the Nagoya Protocol on Access and Benefit-Sharing:

Interim Report – An Attempt of Estimation of Non-Monetary Benefits

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1 Objective

Objective of this presentation session at CEPA Fair is to explain an attempt of estimation of non-monetary benefits of ABS related cases. This estimation is a part of research to develop framework(s) to evaluate expected benefits available by facilitation of the Nagoya Protocol/ABS related activities.

Estimation is simulation by hypothetical cases. Conditions for the simulation are, however, carefully set. Characteristics of actual cases and those of provider countries are reflected in the conditions and the cases.

Various non-monetary benefits are specified in the Bonn Guidelines and in Annex of the Nagoya Protocol. Amongst these, this session tries to highlight technology transfer in a narrow sense, income generation by training, income generation by providing equipments, additional benefits by conservation of collection site for genetic resources, improvement(s) in efficiency of production in genetic resources related industry, and saving costs of negotiation for obtaining PIC of ABS.

Some of them are explained with specific figures by simulation in this session. Some of them are explained later when the research is completed.

2 Methods

2.1 Basic Methodology

Step 1: Setting up Conditions for Estimation

Three hypothetical cases in three different countries are designed. Different conditions to estimate non-monetary benefits are set up respectively.

Cases try to advocate typical and common characteristics of actual ABS related activities. Furthermore, conditions are carefully considered so that they reflect characteristics of the countries. Characteristics are, for instances, a level of economic development, a amount of transfer of capital (both private and public sectors), a level of capacity to host ABS related activities, biological and genetic resources suitable for ABS related activities (*e.g*. microbial, plant, or zooidal), situations of stakeholders, and so forth.

By the setting up, the cases, say, simulation, are hypothetical but consist of plausible conditions. An important thing is that the cases can provide some standards that can be modified to specific cases. Those who can access to detailed information of an actual case can estimate expected non-monetary benefits more precisely, adapting the method and modifying the conditions.

Step 2: Estimation of Ripple Effects by Input-Output Analysis

Input-output analysis (IOA) is used to simulate non-monetary benefits. IOA is one of the standard

tools in economics that is often used in macroeconomics. By this method, non-monetary benefits are estimated as ripple effects by ABS related activities for a whole economy of a country. Benefits as effects are expressed as increases in amounts of gross domestic products (GDP).

One of the advantages of IOA as a method is that it can evaluate detailed effects by one industry to other industries. For instance, suppose that production in bio-related industry increases such as an increase in production of functional food due to technology transfer by ABS related activities. The increase in production can be observed not only in bio-related industry but also in some other industries such as agriculture, machinery, and transportation. This is because demand for input by agricultural sector increases by increases in production of functional food. In addition, traffics in transportation sector are expected to increase, because increased production of functional food needs increased traffics for distribution. IOA can evaluate these effects precisely.

Step 3: Clarifying Benefits

In addition to non-monetary benefits that are estimated by IOA, some other benefits available by ABS related activities deserve to be specified. Some already exist in actual cases and some emerge through facilitation of ABS.

One benefit in this context is the benefit for conservation of biodiversity through ABS related activities. One actual case suggests that forests can be conserved at least for a duration in which samples of plants are being collected in the forests. The forests might have been destroyed without the activity. This is nothing but conservation benefit available by ABS.

The other benefit is a cost saved for negotiations to obtain PIC and/or MAT when well-organised ABS related laws and institutions responding ratification of the Nagoya Protocol can provide efficient process for them. One actual case suggests that a transaction cost to reach agreement for ABS is very high to the extent at which the cost is a burden for the user. Improved regulation can bring cost-saving, say, benefits.

2.2 Target Countries

Three Asian countries are adopted for estimation.

Country A : Low income
Country B : Low income – but rapidly growing
Country C : Middle income – but not a OECD member country yet

Country A is a landlocked country. Her altitude is very high. Major industry is agriculture. GNI (Gross National Income) per capita is US$400 approximately.

Country B is located in Indochina peninsular and has a long coastal line on the eastern side of the country. GNI per capita is approximately US$1,400. She is still a low income country but is rapidly growing.

Country C is a middle income country in Southeast Asia and her GNI per capita is approximately US$3,000. The amount of inflow of foreign direct investment is very high and she is providing

official financial aid to other Asian lower income countries. The country already has had sufficient technology in a narrow sense. It means that know-how of business to access to the world market is desirable rather than technology.

3 Hypothetical Cases

Three hypothetical cases have been designed for simulation

Case 1 in Country A

Target resource(s) :

Mushrooms

Beneficiary (ies) :

Research institution (counterpart), staff of the research institution, and local farmers

Activities :

1) Collection and screening of mushrooms to try to find useful ingredients for functional food
2) Inviting staff for doctoral programme in the user country
3)Training of farmers (mushroom cultivation)
4)Payment of honorarium to farmers for collection of mushrooms

The Story of Case 1:

A user of resource is a governmental research institute from developed country. A provider is governmental research institute. A main goal of PIC for MTA is to develop a new functional food from mushrooms.

During this process, first of all, local farmers have opportunities to be trained for cultivation of mushrooms from which they can generate incomes. Secondly, some of the farmers are employed as an assistant of the research for collection of the mushrooms. For this, honorarium is paid. Thirdly, a researcher of the institute has an opportunity to be enrolled as a doctoral student in the provider country's university. Doctoral programme is unavailable in the provider country. The researcher is supposed to contribute to improvement in productivity of food industry, adapting technology obtained through the doctoral programme.

Case 2 in Country B

Target resource(s):

Medicinal plants

Beneficiary (ies):

University and local farmers

Activities :

1) Collection and screening of medicinal plants for research
2) Instructing doctoral students
3) Training of farmers (medicinal plant cultivation)
4) Payment of honorarium to farmers for collection of medicinal plans
5) Infrastructure development so that further ecotourism is possible

The Story of Case 2:
A user of resource is a governmental research institute from a developed country. A provider is a state university. A main goal of PIC for MTA is to develop new Chinese medicine from medicinal plants. The site for the activities is located adjacent to a national park where cultivation of medicinal plants is possible and where overexploitation of the medicinal plants is concerned unless the cultivation is limited to the sustainable amount and is regulated by appropriate ways.

During this process, local farmers have opportunities to learn how to cultivate medicinal plants. They can sell them to markets under the regulation to avoid overexploitation. Secondly, some of the farmers are employed as an assistant of the research for collection of the medicinal plants. For this, honorarium is paid. Thirdly, the provider gives lectures for doctoral students or instructs them at the university that results in technology transfer by which production of industry of "other food" increases. Fourthly, the provider carries out infrastructure construction so that tourists can visit places that contain beautiful landscapes and that are suitable for medicinal plant cultivation. Tourists favour eco-tourism from which the farmers can generate incomes such as an accommodation fee and a guide fee.

Case 3 in Country C
(To be designed for the next stage of this research)

4 Tentative Results

Estimation (*i.e.* simulation) results for the economy as a whole for each condition of each case are shown below.

Case 1 in Country A

1) (Collection and screening of mushrooms to try to find useful resources for functional food)
2) Inviting staff for doctoral programme
3) Training of farmers (mushroom cultivation)
4) Payment of honorarium to farmers for collection of mushrooms

Components	**Benefits for Stakeholders (Providers)(A)**	**Benefits for the Country as a Whole (B)**	**Ratio (B)/(A)**
Inviting staff for doctoral programme	Increase in productivity in food industry by 0.01%	5,722	-
Training of farmers (mushroom cultivation)	200,000	371,000	1.85
Payment of honorarium to farmers for collection of mushrooms	800	1,086	1.35

Note: Unit US$

Case 2 in Country B

1) (Collection and screening of medicinal plants for research)
2) Instructing doctoral students
3) Training of farmers (medicinal plant cultivation)
4) Payment of honorarium to farmers for collection of medicinal plans
5) Infrastructure development so that further ecotourism is possible

Components	**Benefits for Stakeholders (Providers)(A)**	**Benefits for the Country as a Whole (B)**	**Ratio (B)/(A)**
Instructing doctoral students	Increase in productivity in other food industry by 0.01%	124,961	-
Training of farmers (medicinal plant cultivation)	5,000	15,115	3.02
Payment of honorarium to farmers for collection of medicinal plans	2,000	3,868	1.93
Infrastructure development so that further ecotourism is possible	34,500	91,608	2.65

Note: Unit US$

5 Analyses of Effects of ABS Related Activities on Provider Countries by Scenarios

Figures above are suggestive. In addition to these, further analyses can bring better understanding on "frameworks" on the whole available non-monetary benefits. Actually, benefits above are annual benefits of one activity, while effects of the activities sustain for several years and while a number of activities are simultaneously possible. Moreover, some benefits that haven't been estimated above are possible. Hence, it is useful to organise the benefits into some frameworks by scenarios.

Scenario A: **Non-monetary benefits for a low income country such as country A**
Scenario B: **Non-monetary benefits for a low income country such as country B**
Scenario C: **Non-monetary benefits as merger of those for both countries A and B**
Scenario D: **Non-monetary benefits if the number of ABS related activities increase by the introduction of the Nagoya Protocol**
Scenario E: **Non-monetary benefits for a user country by a decrease in transaction costs**

Scenario A: Non-monetary benefits for a low income country such as country A

This should be emphasised that benefits can be generated for years. If simply suppose that benefits continues to be generated for 10 years (this is absolutely assumption but does not change the essence of the analysis even if it continues for 5 year or 20 years) , net present value (NPV) of the benefits by one ABS related activity in 10 years with discount rate 10% is:
US$2,321,467, while the total of annual benefits is **US$377,808.**

Scenario B: Non-monetary benefits for a low income country such as country B

The same calculation with country A for country B is:
US$1,447,365, while the total of annual benefits is **US$235,552**.

Scenario C: Non-monetary benefits as a merger of those for both countries A and B

It is possible – quite naturally – to carry out two activities simultaneously in one country, though "mushrooms activity" has been designed for country A and "medicinal plants activity" has been done for country B in order that characteristics of each country can be reflected in the cases. If two cases are carried out in ONE country, the benefits for the country can simply be re-written as shown below.
NPV of the activities is **US$3,768,832,** while the total of annual benefits is **US$613,360**.

Scenario D: Non-monetary benefits if the number of ABS related activities increase by the introduction of the Nagoya Protocol

It must be very controversial to say, on the one hand, that the number of ABS activities will automatically increase by the introduction of the Nagoya Protocol. It is sensible to say, on the other hand, that well-organised laws and/or institutions responded to the protocol are able to make processes of ABS more efficient. The number of ABS related activities, say the number of PIC and MAT is expected to increase.

A document prepared by the National Biodiversity Authority (NBA) (of India), "Access and Benefit Sharing Experiences from India", says a very suggestive thing. Since the Biological Diversity Act (of India) entered into force, 100 ABS agreements have been signed. Although it should be emphasised that the number depends on characteristics of Indian generic resources and the Act, it is sensible to infer that reaching ABS agreement has been facilitated due to an existence of the Act and NBA.

Benefits for scenarios A, B, and C are just those by one or two cases. You may estimate more numbers of cases to estimate benefits for the country as a whole.

It is too rosy to expect that the number of cases in countries A and B will automatically increase to 100. However, for simulation, the figure that benefits of scenario C are multiplied by 50 is useful. You have the figures below.

NPV of the activities is **US$188,441,584,** while the total of annual benefits is **US$30,668,000**.

Scenario E: Non-monetary benefits for user country by a decrease in transaction costs

In case A, there has been found that the amount of a transaction cost is very high. A business trip for ABS negotiation to the provider country from the user country costs US$4,000 and was 12 times in 4 years. US$50,000 was approximately needed for negotiation and is regarded to be the transaction cost.

The same discussion, here, appears. Well-organised laws/institutions are able to make processes of ABS more efficient and this transaction cost can be decreased by these.

There is no criterion at all but **US$25,000 can be saved** if simply it is supposed that the times of negotiation halved. This saving influences overall benefits that are planned to be analysed as shown "Further Research 3)".

6 Further Research

For completion of the research and for informative results for decision makers especially for the provider countries of the resources, components below are planned to be carried out.

1) Design of a hypothetical case and simulation of country C

Simulation for country C is to be carried out. One of the reasons for not presenting this at this timing is that a plausible case could hardly be designed, because this country has too many options. In addition, technology transfer in a narrow sense that is important in ABS is not the top priority from the viewpoint of this country. Country C does not need "technology transfer" but needs "know-how transfer". Even if the case can hardly be designed, ABS can happen in middle income countries. Hence, the research is to estimate non-monetary benefits in country C, trying to reflect characteristics of this country.

2) Consideration of effects of exports

Mushrooms and medicinal plants are exported. Actually, export demand for medicinal plants is very high. This may be added into simulation.

3) Effects of transaction costs saved on ripple effect

When ABS related laws/institutions are well-organised, a duration of negotiation for PIC is expected to be shortened. If so, a cost for negotiation, say, a transaction cost is saved. This saved cost can be used for additional non-monetary benefits such as providing equipments. Providing equipments implies increases in demand for machinery. This turns out to be non-monetary benefit for a country as a whole through ripple effects of the increases in production.

4) Analysis on the relationship between ABS related activities and biodiversity conservation

The relationship between ABS related activities and biodiversity conservation is always specified in

the arena of the Nagoya Protocol but is not recongnised very often when actual activities are considered. There exists a case in which an ABS case provide fund for forest conservation. By this fund, forest destruction is postponed at least during the period when bio-prospecting is conducted.

In fact, medicinal plants are facing a danger of overexploitation and it can be avoided if funding for conservation is available by ABS related activities. Conservation of biodiversity can generate "multiple benefits". It means that considering the relationship above cannot be overestimated. Further research explores this point.

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About the Contributors

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Professor Mikihiko WATANABE, who specialises in environmental economics and development economics, has been being involved in CBD and ABS for years. He is a former expert of the Meeting of the Group of Technical Experts on an Internationally Recognized Certificate of Origin/Source/Legal Provenance held in 2007 in Lima, Peru. One critical contribution in the context of economic values of biodiversity is his economic evaluation of microbial genetic resources. While many research outcomes on values of ecosystems and biological resources are available, economic evaluations of the genetic level are very rare. At the University of Yamanashi, Professor Watanabe tries to integrate life science, environment conservation, and economics towards the three goals of CBD.

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Professor Kiyoshi FUJIKAWA, who specialises in econometrics and statistics, has been playing an important role in the field of international development. He previously worked at the Statistical Office of the UN. He is a former Dean of the School and has been fostering graduate students from around the world and cooperating with international organisations such as the Asian Development Bank, JICA and so on. Amongst the analytical methods available, he is expected to contribute to this research through input-output analysis that can evaluate non-monetary benefits and that can be a breakthrough in the field of ABS.

The Faculty of Life and Environmental Sciences at the University of Yamanashi was established in April 2012 and started enrolling students in the same month. The Faculty aims to educate students who are able to contribute to realising the well-being of local communities through sustainable food supply, while the University of Yamanashi as a whole strives to foster experts who can be crucial actors in society. The students are expected to obtain a broad perspective and knowledge on life sciences, food production and processing, the environment and energy, local economy, corporate management, and governmental administration.

The Faculty consists of four departments: the Department of Biotechnology, the Department of Local Produce and Food Sciences, the Department of Environmental Sciences, and the Department of Regional Social Management. The four departments provide interdisciplinary knowledge by which the students can tackle important issues in the 21st century in life sciences, food, the environment, and economies. Through these studies, graduates are expected to resolve problems in society.

The Graduate School of International Development (GSID) at Nagoya University was established in 1991 and celebrated its 20th anniversary last year in 2011. GSID's educational goal is to nurture graduates who have the ability to carry out independent research and practical work and also have a global view firmly rooted in cross-cultural understanding. GSID will continue its work as a dynamic international research and educational institute.

Since Japan has few mineral and energy resources, it needs to purchase these resources from overseas, mostly developing countries. Trade with foreign countries is therefore the lifeline for Japan, and it is ODA that plays an important role in maintaining this lifeline. What, then, are we—as social science researchers—able to do to this end? Although what social science can contribute to society may be limited in the short run, in the long run it can offer valuable pointers to those who face a disadvantaged economic and social environment. In order to fulfil this role, we work on research with sincerity and disseminate our achievements.