The meaning of institutions for biofuel production and farming systems development – The case of oil palm production in Indonesia

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Abstract: *The impact of farming and rural systems is determined to a great extent by local, national and international institutions and governance structures, i.e. by established and prevalent rules that structure social and nature-related interactions. In view of a rising demand for biofuels there is a need to know what is special about those institutions and governance structures which bring about sustainable biofuel production in farming and rural systems. This paper aims to spot on a conceptual level the role institutions play in the development of biofuel production in farming and rural systems. First some definitions of institutions are reviewed, and the way how institutions impact farming and rural systems development. Further, the Institutions of Sustainability Framework for analysing transactions and institutions in nature-related sectors are introduced. The role of institutions for sustainable biofuel production in farming and rural systems is discussed for the case of oil palm production in Indonesia. Finally, some challenging questions are raised from an institutional economics point-of-view. The dynamics of oil palm production mainly depends on the ability of actors to govern transactions and control interactions under their rule. The similar proliferation of smallholder plantations and large company plantations in terms of area in Indonesia, as well as the dissimilar development in terms of productivity, is explained by the institutional setting, rather than by economies of scale. Therefore, considering the institutional economics of biofuel production is a key for achieving sustainable development in this sector.*

Keywords: *Institutions, Transactions, Farming and Rural Systems, Oil Palm, Biofuel, Indonesia*

Introduction

Palm oil production in Indonesia has risen sharply in the last few decades (GAPKI, 2007). This has been achieved to a large extend through the expansion of area and to a lesser extend through an increase in crude palm oil (CPO) yields (Fig. 1). It has been argued that part of this rapid expansion of the area is due to a rising demand for biofuels. The contribution of the predominant farming systems to this development as well as their impacts is very different. While government owned plantations increased relatively little, the plantation area cultivated by private companies increased considerably. The area of smallholder plantations augmented as well, although a large amount of this area is so-called 'plasma' area, i.e. plantation area allocated to smallholders in the frame of outgrower-schemes initiated by the government and/or private companies. In view of the projected further expansion of oil palm production in Indonesia (other countries as well) there is a need to better understand the role of institutions for the development of oil palm production and to know what is special about those institutions and governance structures which bring about sustainable biofuel production.

The development of farming and rural systems is heavily determined by the local, national and international institutions. Institutions are the kinds of structures that matter most in the social realm: they make up the stuff of social life (Hodgson, 2007). Regulations in providing funds, expertise, training opportunities, institution building, conditions in the provision of resources are some relevant sectors of influence. There is a need to know what philosophy, targets and concepts are behind institutional actions and strategies with regards to the development of biofuel production and what implications at farm family and rural level follow out of this. Therefore, special attention should be given to institutions and institutional economics when studying farming and rural systems development.

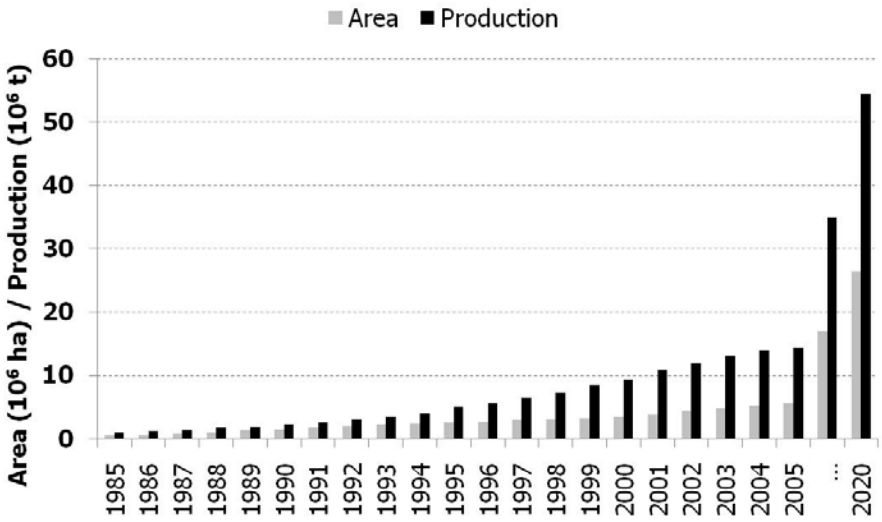

Figure 1. Development of total oil palm plantation area and production in Indonesia (Source: GAPKI, 2007)

The objective of this paper is to mark the meaning of institutions for the development of biofuel production in farming and rural systems. First some definitions of institutions are reviewed before showing on a conceptual level how institutions impact farming and rural systems development. Further, the Institutions of Sustainability Framework for analysing transactions and institutions in nature-related sectors is introduced. Finally, the institutional factors that determine the development of biofuel production in farming and rural systems in Indonesia are discussed.

Institutions of Sustainability Conceptual Framework

It is not possible to carry out any empirical or theoretical analysis of institutions without having some adequate concept of what institutions are. North (1992, p. 3) defined institutions as the rules of a society that structure social interactions and constraints on human actions, i.e. "Institutions are the humanly devised constraints that structure political, economical and social interaction". „In order to express it in the language of economists: institutions define and limit the choices of individuals" (North 1992, p. 4). Accordingly, "(…) Institutions both constrain and enable behaviour. The existence of rules implies constraints. However, such a constraint can open up possibilities: it may enable choices and actions that otherwise would not exist. For example: the rules of language allow us to communicate; traffic rules help traffic to flow more easily and safely; the rule of law can increase personal safety." (Hodgson, 2007).

The institutional environment comprises a set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution. Rules governing elections, property rights, and the right of contract are examples. The traditional understanding differentiates between formal rules sanctioned by third party and informal constraints including norms of behaviour, conventions and self imposed codes of conduct. The formal institutional environment embraces property rights, contract law and business law. The informal institutional environment consists of culture, customs, norms, networks and social capital (North, 1990; Williamson, 2000).

At some stage it is necessary to consider how institutions structure social interactions and in what senses they are established and embedded. Generally, institutions enable ordered thought, expectation and action by imposing form and consistency on human activities. They depend upon the thoughts and activities of individuals but are not reducible to them. In part, the durability of institutions stems from the fact that they can usefully create stable expectations of the behaviour of others.

Conceptual Framework

The explanations above give a vague idea about the importance of institutions and institutional economics for farming and rural systems development. Institutional analysis in nature-related sectors has to account for some particular properties, since in nature-related sectors so-called 'non-commodities' are provided by processes of self-organization in nature. These transactions are not engineered by humans and their main inherent problems are frictions plus the coherence and interconnectedness of the processes. These 'linkages' are perceived as the reasons why transactions need to be regularized by institutions and governance. Therefore, institutional analysis in sectors which are not completely designed by humans, like in nature-related sectors, has to take into account the specific properties and costs of the transactions. The Institutions of Sustainability Framework was specifically developed for dealing with issues of institutional economics in nature-related sectors (Fig. 2) (Hagedorn, 2009).

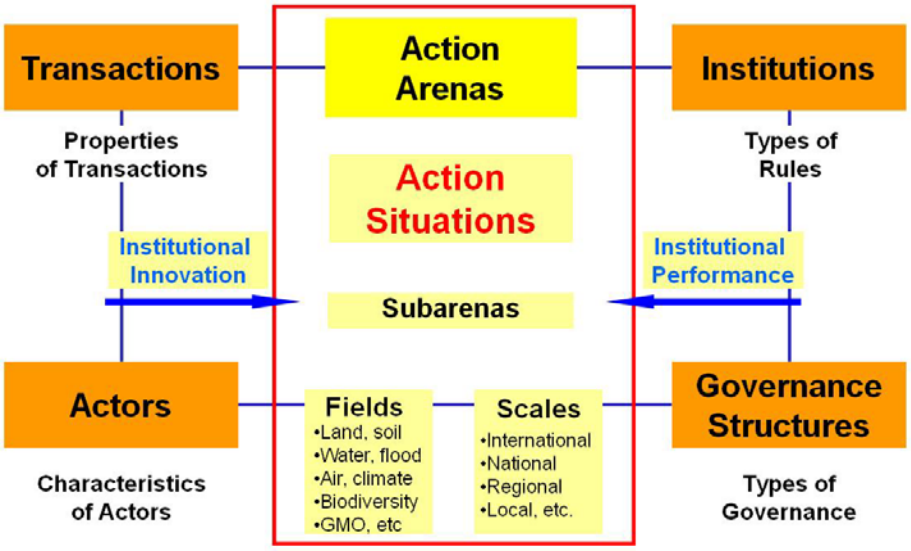

Figure 2. Institutions of Sustainability Framework (Source: Hagedorn, 2009)

The Institutions of Sustainability Framework focuses on how to regularize human action that leads to transactions affecting the relationship between natural and social systems. The approach assumes that institutions and governance structures that make them effective emerge either spontaneously through self-organization or intentionally by human design. How these institutions and governance structures are socially constructed depends on the properties of the transactions and the characteristics of the actors. Actors and the properties of transactions are therefore a very central issue in institutional analysis.

Actors

Institutional Economics considers the specific attributes, values and believes of actors, their reputations and trustworthiness, their resources for influencing rule-making, their capacities for acquiring, processing and using knowledge. They are understood as "complex actors" characterized by specific mental models, ideologies and bounded rationality. They follow sets of beliefs about morality, income distribution, and institutional structure of society (i.e. ideology). Therefore, the subjective perceptions of the actors play a crucial role. Transactions and preferences dependent from the social and institutional context. Preferences are variable, but they are not tradable among each other, as assumed in economic efficiency theories. Further, because information is costly and incomplete, actors are characterized by different degrees of information and by different methods of action selection, i.e. decision-making. Some characteristics of actors involved in agro-environmental

co-ordination include: values, beliefs and attitudes, reputations for trustworthiness, resources for influencing rule-making, capacities for acquiring, processing and using knowledge, asymmetric information and method of action selection (maximising, bounded rationality, fallible learners). Finally, the social context and embeddedness in communities is crucial for crafting and using rules for resource management (e.g., in irrigation, fishery, pastoral systems, protected areas).

Transactions

The perception of properties of transactions in nature-related sectors originate from non-separable activities (i.e. coherence of the system, structural interconnectedness, functional dependence) and 'non-commodities' (i.e. goods and services, resources and amenities, but also damages and nuisances, provided by processes of self-organisation not engineered by humans). These 'linkages' are perceived as reasons why transactions in nature-related sectors need to be regularized by institutions and governance.

Integrative and Segregative Institutions

The Institutions of Sustainability Framework differentiates between integrative and segregative institutions. Integrative institutions allow actors who make decisions on transactions, not only to profit from beneficial effects, but they also hold them liable for adverse effects. Similarly, they not only make them internalize the transaction costs they cause, but also protect them against transaction cost resulting from activities of others. Decision makers enjoy all benefits and bear all costs of their own decisions, and decisions made by other actors will cause them neither gains nor nuisances. Segregative institutions force actors who make decisions on transactions to refrain from receiving all gains from beneficial effects, but also allow them to shift some of the nuisances resulting from adverse effects to other actors. They may externalize transaction costs within limits, but can also not avoid bearing transaction cost caused by decisions made by others. Decision makers forego benefits and avoid costs although they have caused them, and actors who have not participated in decision making will have costs and enjoy benefits (Hagedorn, 2009).

Integrative and Segregative Institutions can also be looked at from the social perspective on transactions. Integrative (segregative) institutions do not internalize (externalize) transaction costs and effects of transactions directly. They do this by creating or demanding, or not creating or demanding, the willingness and capacity of actors concerned by the transactions to do so. The segregating or integrating power of the institutions enables them to solve the conflicts caused by the effects of the transactions by regularizing difficult interdependencies (Hagedorn, 2009).

The Role of Institutions in Farming and Rural Systems Development

The Farming and Rural Systems Approach stresses the importance of the horizontal and vertical relations in which actors (or decision makers) partake, as well as the relation to time (Doppler, 2000). The horizontal relation includes all kind of transactions between the farm, household and off-farm/off-household. The vertical relations comprise the transactions between actors at the family, village, regional and national levels (Fig. 3).

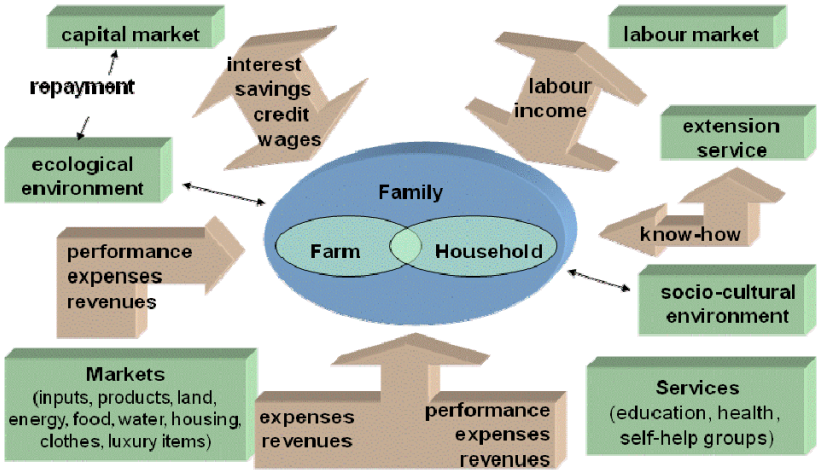

Figure 3. The farm, family and household complex and its relations to the outside world (Source: Doppler, 2000).

The multiple transactions in farming and rural systems development take place within the natural as well as within the social system, and they also take place between the social and the natural system. Institutions play the role of intermediation in these transactions. Human actions may have very different impacts depending on the institutions in place. The impact of farming and rural systems on the ecosystem and vice-versa is therefore determined to a great extent by the institutional environment (Fig. 4).

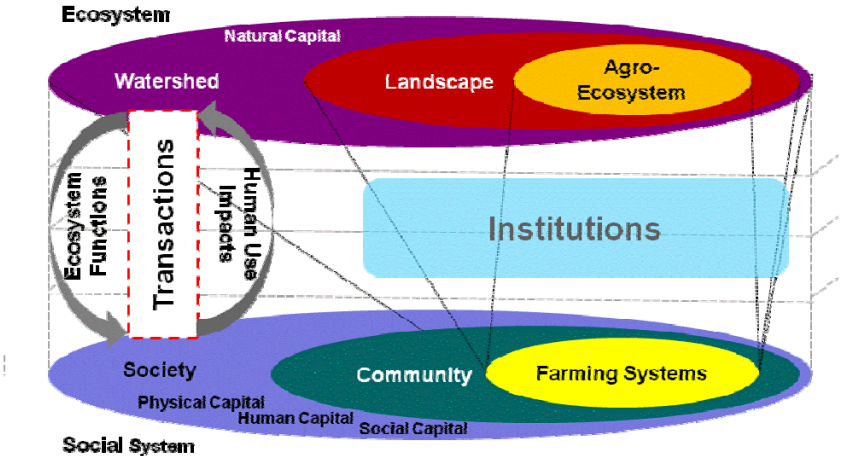

Figure 4. Interactions between social and natural systems (Source: adapted from Hagedorn, 2009).

The transactions taking place within the farm-family-household complex and with the outside world are the core unit of analysis in institutional economics. The focus is on „transactions“ as problems of coordination in situations of exchange, coordination and cooperation between people, for economic purposes (voluntarily or not), and the role of institutions and actors in solving the coordination problem, its organization and outcome. The institutional innovation and how institutions and governance structures are socially constructed depends on the properties of the transactions and the characteristics of the actors.

The impact of institutions on farming and rural systems development are multi-faceted, since “(…) the rationality (of actors) depends crucially on the institutional setting” (Hodgson, 1998). Institutions mediate the human relationship to the world by a social logic of significance, and constitute by that scheme the relative subjective and objective terms of the relationship. Institutions may be understood as “(...) choice sets and influence individuals with regard to their abilities, ideals and

needs" (Vatn, 2005). "Individuals are socially created and carry norms, values and expectations. "Reciprocal typifications" and these routines relief the actors of effort.

The efficiency of resource use in farming and rural systems is closely related to the institutional setting. This is reflected in statements like Bromleys' (1989): "Efficiency is a reflection of the defined rights and interests protected by institutions". Nevertheless, resource efficiency is not necessarily the main objective of institutions, but „(…) The main purpose of institutions is to establish a stable (but not necessarily efficient) order in order to reduce insecurity in human interaction" (North 1992, p. 6). Another result based on the work of North (1990) highlights that institutions are supportive "(…) to cope with uncertainty and increase individual utility, achieve benefits of collective action (based on institutions)". Uncertainty, risk, individual utility and collective action are recognized as determinant factors for farming and rural development (Doppler, 1992). Besides the impacts on efficiency, risk and utility, institutions determine to a great extent the distributional implications of farming and rural systems development as institutions are "(…) durable systems of established and embedded social rules that structure social interactions in society either similarly, differently or unequally for different groups in society" (van Starveren & Odebode, 2007).

A question that comes up with the potential impacts of institutions is about the performance of institutions and institutional innovation. "Any assessment of innovations or problem-solving strategy must measure its impact on the needs of the decision-makers. Sustainability of development is only feasible if innovations, activities and measures meet the short and long-term objectives of the decision-makers. Uncertainties when making decisions and risk as soon as actions are taken are central issues of the assessment" (Doppler, 2000). The impact of innovations or problem-solving strategies on the needs of the decision-makers are strongly defined by the institutions and the properties of the actors. Therefore, it is a need to know what is special about those institutions and governance structures which bring about sustainable farming and rural systems.

To deal with the impacts and effects of new measures, innovations or problem-solving strategies generally some kind of institutional change or adaptation is required until attaining compatibility between the measures and the institutional environment (Fig. 5). This institutional change may happen spontaneously (due to conformism, intentional adoption or authoritarian relations) or it may be designed due to values, power, interests and their protection; but in any case institutional changes require legitimacy and the potential for various parties to change the rules.

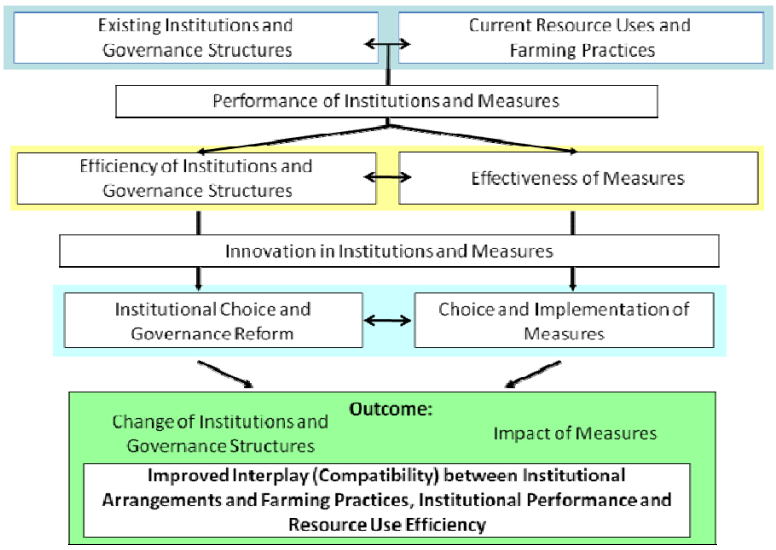

Figure 5. Institutional Performance and Institutional Innovation (adapted from Prager, 2009).

In this context, institutional performance requires to match the properties of transactions with the regularizing capacity of institutions and governance structures. This is '… align transactions (which differ in their attributes) with governance (which differ in their costs and competencies) in a discriminating ... way' (Williamson, 1996). Further research is needed, to assess whether this match or alignment can be found in the dichotomy of 'integrative and segregative institutions', and what role institutions can play in defining and implementing environmentally sound strategies.

The Case of Oil Palm Production in Indonesia

A feature of oil palm development in Indonesia is the variety of farming systems (e.g. smallholder plantations, government plantations and private company plantations) and plantation sizes (e.g. from smallholder plantations with about five hectares to private company plantations with up to 20.000 hectares) (Horas and Sembiring, 2009). Another feature is that the farming systems have spread at different rates (Table 1).

Table 1. Oil Palm area and productivity by different farming systems in Indonesia (GAPKI, 2007).

	1985	2005	
	Area (10^6 ha)	Area (10^6 ha)	Productivity (t Crude Palm Oil / ha)
Government plantations	0.34	0.68	2.04
Private company plantations	0.14	3.00	2.80
Smallholder plantations	0.12	1.92	2.09
Total	0.60	5.60	2.57

The development of the area and productivity of oil palm production in the different farming systems in Indonesia shown in Table 1 may be related to the existing institutional setting. The hypothesis, that actors who are able to shape the institutions in place are also the main beneficiaries from the oil palm development in Indonesia, still needs to be tested.

For better understanding the reasons behind the disparate development of the farming systems one has to look at the transactions within the system and their properties, as well as the actors acting within the oil palm system and their properties (Fig. 6). The dynamics of farming systems in the oil palm sector is the outcome of several interactions and transactions at the production system, and depends on the ability of actors to govern transactions and control interactions under their rule. While private plantation companies are able to govern most of the transactions and shape the institutions within the oil palm sector, in most cases smallholders are subject to accept the conditions imposed to them. Company plantations have managed to regularize most of the transactions taking place in the system of oil palm production. Smallholders are the most vulnerable: they are banned to participate in crucial transactions; additionally, they lack technology, resources and power for effectively controlling the interactions of the production process or the transactions with other actors. Whereas smallholders bear a very weak position in the transaction with millers, company plantations are able to integrate the production with the processing. Company plantations groups strongly influence government's decisions, while smallholders are sometimes harmed by these decisions. Company plantations can cancel or reduce many uncertainties and risks of the system by covering and controlling effectively as many transactions as feasible.

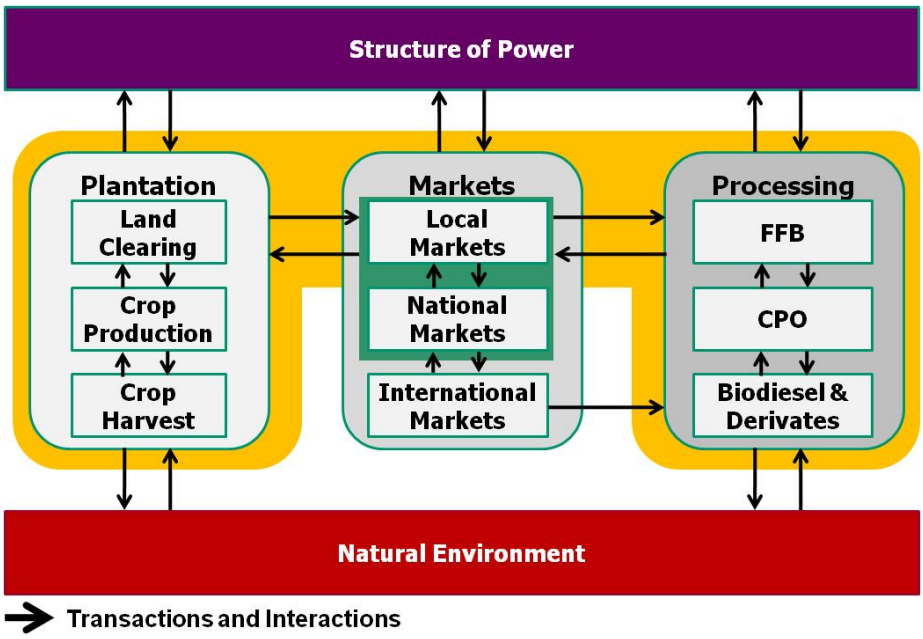

Figure 6. Transactions and interactions in the palm oil production system

Palm oil plantations have been subject to many critics, among others because of the large amount of deforested area and the resulting greenhouse gas-emissions. In these cases, the impact of the different farming systems on the natural system is similar. An example is the amount of CO_2 emitted during deforestation of peat-land for the purpose of establishing oil palm plantations, which is the same irrespective of the type of farming system, i.e. either smallholding, private company or government owned plantation.

Recent initiatives to establish institutions such as certification systems for sustainable oil palm production (e.g. RSPO, ISCC and others) are believed to be the result of an increasing dissatisfaction of consumers with oil palm production practices in Indonesia and elsewhere. Figure 7 shows how the process of institutionalizing the transaction "emissions from forest clearing" may take place: As actors choose to clear peat land for establishing oil palm plantations direct impacts on ecosystem components occur, e.g. local and regional air pollution. The action may also impact on the wider physical system, e.g. increasing CO_2 emissions into the atmosphere. Ecosystems respond to these changes by adaptation processes, e.g. with climate change. The outcomes of these responses may affect actors not directly involved in oil palm production, e.g. when people in other parts of the world suffer from floods or droughts that result from climate change. Actors participating in the described transaction change their behaviour as they recognize their interdependence regarding the use of the natural system. This stimulates interaction, negotiation, consensus building on rules between actors directly and indirectly concerned. An institution like the "Round Table of Sustainable Palm Oil Production" (RSPO) is an example for an outcome of such a negotiation and rule making process between many actors.

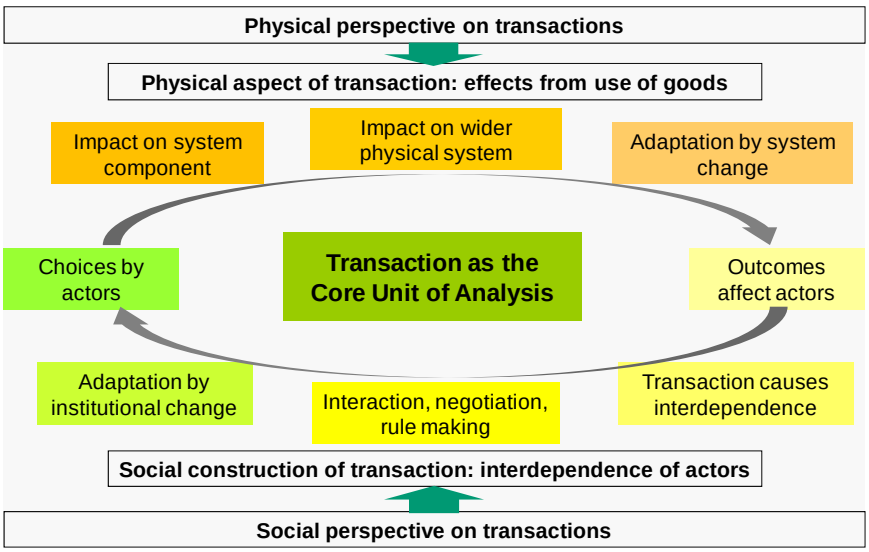

Figure 7. Transaction-interdependence cycle.

As a consequence of negotiations, an adaptation processes taking place in the social system institutional change and enforcement mechanisms may result. A certification scheme may for example include rules for land use such as peat-land becoming “no-go areas”. Finally, the actors adjust their choices to the new rules and enforcement mechanisms. If the actors accept the outcomes, the ‘Transaction-Interdependence Cycle’ will end, otherwise it may start anew.

A decisive factor for the impact of any institutionalized transaction like the one described above on the farming and rural system is definitively the integrative and segregative capacity of the institutions agreed upon. Regarding the beneficial effects, the question is if smallholders will be able to appropriate the benefits of a certification systems in the same way private company plantations or government plantations do, or will company plantations appropriate all benefits from a certification system and leave no gains to others? Regarding the adverse effects the question is if oil palm plantations will be able to deny complete liability and shift the nuisances to others, or if all farming systems will forego some benefits equally and leave gains to others.

Conclusion

The conceptual application of institutional economics to the case of biofuel production in Indonesia shows that institutions are a key factor influencing the development of biofuel production in farming and rural systems. Patterns of unsustainable behaviour have emerged over long periods of time and are highly resistant to change. They are largely determined by institutional arrangements. Resistance to change results from practices becoming embedded in formal and informal institutions, high and/or unclear costs and risks of institutional change, and/or because some actors benefit from present misfits. Without institutional change a purposeful move towards sustainability will not take place, i.e. the goal may not be reached with the given institutions. Therefore, inventing a system of compatible rules, organizations and governance structures becomes necessary.

Nevertheless, it remains unclear how and to what extent regulations in resource use, land tenure as well as state and project interventions can influence a development towards ecologically sound and economically profitable systems? How and to what extent can joint learning and collective actions influence this development? What is special about those institutions and governance structures which bring about sustainability?

An increasing awareness of the need to include the role of institutions and administration at the village and regional levels is necessary when implementing strategies for biofuel production. The intention of considering the complexity of the real world in which farmers and farm families live and make decisions may be considered as the greatest challenge. The analysis of institutions may

contribute to a better understanding of the decision-making processes in farming and rural systems and consequently extension services will offer more realistic solutions whose adoption rate of innovations provided will increase. A better understanding of the decision makers` environment and relations to conditions determined at the village and regional level with special reference to resource availability, allocation and infrastructure, is one major necessity where institutional economics can contribute significantly within the farming and rural systems approach. Finally, policy analyses and design, e.g. of certification schemes for sustainable biofuel production, need to consider the institutional setting in which the actors make their decisions to provide more realistic information about the reaction of actors´ to alternative policy options.

References

Berger, P. and T. Luckman ([1967] 1991) The Social Construction of Reality. *A Treatise in the Sociology of Knowledge*. London: Penguin Books.

Bromley, D. W. (1989) Economic interests and institutions: The conceptual foundations of public policy. Oxford: Basil Blackwell.

Doppler, W. (1992) Application of the Farming Systems Development Concept in Development Projects. *Technical Paper*. FAO, Rome

Doppler, W. (1994) Farming systems approach and its relevance for agricultural development in Central and Eastern Europe. In: Dent, J.B. and McGregor, M. J. (eds.): *Rural and Farming Systems Analysis*. European Perspectives. Wallingfort. Pages 65-77.

Doppler, W. and A. Koutsouris (eds.) (2000) Rural and Farming Systems Analyses: Environmental Perspectives. Proceedings of the Third European Symposium the Association of Farming Systems Research and Extension in Hohenheim, Germany, March 25 to 27, 1998.

GAPKI (2007) www.gapki.org.

Hagedorn, K. (2008) Particular Requirements for Institutional Analysis in Nature–Related Sectors. European Review of Agricultural Economics. Vol. 35 (3) pp. 357–384.

Hodgson, G. M. (1998) The approach of institutional economics. Journal of Economic Literature, 36, 166–192.

Hodgson, G. M. (2006) What are Institutions? Journal of Economic Issues. Vl. XL. No. 1. March 2006.

Hodgson, G. M. (2007) Evolutionary and institutional economics as the new mainstream? In: Evolutionary and Institutional Economics Review, 4, 7–2.

Horas, J. and S. Sembiring (2009) Smallholding Oil Palm and large–extent farm in Indonesia: Roles, Opportunities and Challenges. International Conference and Exhibition of Palm Oil/ICE–PO 2009.

Lin, J.Y. (1989) An economic theory of institutional change: induced and imposed change. Cato Journal, Vol. 9, No. 1 (Spring/Summer 1989). Copyright © Cato Institute.

North, D. C. (1990) Institutions, institutional change and economic performance. Cambridge: Cambridge University Press.

North, D. C. (1991) Institutions. Journal of Economic Perspective, 5, 97–112.

North, D. C. (1994) Economic performance through time. American Economic Review, 84, 359–368.

Pinto, F., Grundmann, P. and E. Irawan (2010) Interactions, Transactions and the Dynamics of Oil Palm Farms (in preparation).

van Straveren, I. and O. Odebode (2007) Gender Norms as Asymetric Institutions: a Case Study of Yoruba Women in Nigeria. Journal of Economic Issues.

Vatn, A. (2005) Institutions and the environment. Cheltenham: Edward Elgar.

Williamson, O. E. (2000) The new institutional economics: Taking stock, looking ahead. Journal of Economic Literature, 38, 595–613.