

**The role of agricultural ‘knowledge’
in rural communities of Central Sulawesi, Indonesia**

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Summary

Knowledge is a pivotal aspect in the process of agricultural land use decision making. The more knowledge one person owns within the context of human resources and environment, the more he can choose a sustainable and effective use of land. This analysis is based on an empirical study using qualitative and quantitative methods on the example of two heterogeneous structured villages at the rainforest margins in Central Sulawesi, Indonesia. The research is part of the DFG research field 552 “Stability of Rainforest Margins in Indonesia“ (STORMA)¹ and concentrates on the accumulation process of knowledge generation and its impact for land use management patterns. Thereby it is shown, that knowledge is a tender aspect particularly dependent on the existence and structure of organisations within the village frame. This paper includes a strength and weaknesses analysis and gives further recommendations concerning potential improvements, which could lead to a more future-oriented and sustainable agricultural management in fragile rainforest margins.

1. Introduction

Human being and environmental settings in the rainforest margins are ideally related through ecological and socio-economic stability, which guarantees a sustainable use of resources. Generally, land use in Central Sulawesi is significantly characterised by subsistence, predominantly the cultivation of corn, rice and vegetables, but also by the increasing cultivation of cash crops like coffee and cacao. However, all forms of cultivation techniques and land use decision making processes are particularly depending on specific knowledge bases. Thereby knowledge is embedded in external economic and political frameworks as well as individual preferences gained through various information channels, e.g. public media, individuals, organisations and education. The consideration of information flows and the transmission of knowledge is a neglected topic in the context of human-environmental system studies (cp. MEUSBURGER 2003). Hence new approaches need to be discussed.

This paper examines the importance of agricultural knowledge for local people and identifies its impact to land use change in the villages Toro and Bulili at the rainforest margins of the Lore-Lindu National Park (LLNP) in the province Central Sulawesi. Therefore it is necessary to identify impact factors and general knowledge-based processes which contribute to cultural, social, demographical and economical changes. These changes are basically affecting the ecological stability of rainforest margins. In the following this paper introduces the theoretical background of knowledge management, gives further information about the conducted research methods and takes a closer look at the village profiles of Toro and Bulili. The empirical results are further structured through the components school education, cultural knowledge with a special focus on environmental perception and information sources for individual knowledge accumulation.

2. Theoretical background

The influence of the physical-material environment towards the decision management of an actor is primarily structured through a knowingly or subconscious perception, information processing, knowledge accumulation and individual experience. Efficient decision making processes are pivotally based on a high level of achieved experiences, acquired skills and the

¹ STORMA (Stability of Rainforest Margins in Indonesia) is funded by the German Research Community (DFG) as a collective research program between the Universities of Göttingen, Kassel (Germany), Palu (Central Sulawesi, Indonesia) and IPB Bogor (Indonesia). Since the year 2000 various scientists from these institutions are working interdisciplinary on questions regarding the processes of stabilisation and destabilisation in the Lore-Lindu National Park, Central Sulawesi. (www.storma.de)

awareness of complex contexts. Regarding this relation, the individual involvement into a surrounding social system has to be considered (MEUSBERGER 1998; PEET 1998).

Since the beginning of the 20th century there are diverse approaches to categorise and classify the general term “knowledge”. The core essentials of all definitions consider “knowledge” as the sum of all coherent informations which conform to detectable environmental conditions (GRONAU 2004: 12). Though knowledge can be seen as an intelligent system, which is able to apply adjusted reactions and conscious impulses towards specific contexts. Thus the term is described as the basis and main resource of social actions and reflects the internal subjective cognition of individuals. Knowledge can be externalised by signs, news or pictures, saved and distributed by diverse sources through space and time. In turn, externalised and accessible knowledge can be channelled as information. Thus the intermediation of knowledge is possible via an externalisation process that makes it feasible to be interpreted, constructively acquired and modified by individuals and groups.

However, the diverse meanings of knowledge are mainly due to specific individual applications, thus no precise and comprehensive definition exists. Within the following analysis the term “knowledge” is understood as the conscious or subconscious perception, information processing and accumulation of experiences. The appropriate inclusive framework consists of (1) school, as learnable education, (2) lifelong learning, skill development formed by experiences, coincidences and existing social structures and (3) individual knowledge accumulation through organised education transmission beyond the school system in forms of consulting, campaigns or media (MEUSBERGER 2003; STEHR 2001). Additionally, knowledge implicates the capability for (social) actions in regard to operational behaviour, whose effects could be reconstructed by means of attitude and decisions (action theoretical approach).

The applied action based theoretical approach is dealing with the question in how far actors are influenced by knowledge, cognitive capabilities, information and perception. Furthermore the research concentrates on the field of subjective impacts on rules and resources within the existing social and economical structures caused by learning processes and knowledge accumulation. According to MEUSBERGER (2003) and MANDL & GERSTENMAIER (2000), this approach is able to clarify the role of knowledge as an adoption within cognitive processes and analyse action patterns depending on various knowledge bases.

Knowledge and actions are both elements of a complex context. A broad potential knowledge base of an actor or social group is able to gain new alternatives to solve existing problems. It is therefore necessary to choose the best alternatives out of all possible actions. Within this context a rising accumulation of knowledge might also yield to a limitation of action settings (MEUSBERGER 2003: 288). However, no actor acts deliberate against his own interest.

In contrast, a lot of alternatives seem to be operable and promising through actors’ behaviour, who disposes only about limited knowledge, concerning costs, energy, risks and negative consequences of actions as an result of the decision making process. The less able actors are to notice and interpret specific signs of upcoming challenges or natural occurrences, the less ability they have to use parts of gained information on the basis of former experiences. According to the fact that knowledge is individually and actions do reflect personal backgrounds, the analysis requires an actor-based research approach. This is due to different knowledge levels of actors who possess various experiences, information processing capacities and personal potentials. Therefore the interpretation of signals caused by the physical-material environment is always depending on various personal backgrounds. This phenomenon highlights the incapability to be explained through a holistic approach. Environmental impacts on actors are not determined and verifiable in all-purpose.

So far, most existing studies focus exclusively on an acting person as an adaptive individual, who has access to all actual existing knowledge assets and who is generally capable to under-

stand, to use information and transfer this into action. Furthermore, the principally focus is still set on the model of a rational acting person, whereas the examination of concepts, which include social organisations, society and communities, would bare more awareness on certain questions. Next to a single focus on economic determined behaviour a lot of other components play important roles, which were excluded for a long time and now come into awareness. Besides the negotiations of specific individual cognitive processes the disregard of institutional frameworks has to be mentioned (KNÜPFER 2001).

3. Methods

The evaluation method is based on both qualitative and quantitative analysis of empirical data. The basis for the quantitative research was compiled by the STORMA Subproject A1 household census in Toro and Bulili in May and June 2004. Thereby subject matters of demographic, cultural, socio-economic and ecological data were generated and analysed by means of statistical procedures. The household census data includes general information about 898 households concerning education, age, sex and ethnicity of all household members, farming activities, cultivation products, market access and information sources such as the educational background.

By the selection of specific criteria and in regard to the basis of the A1 Census results 28 (Toro) and 26 (Bulili) households were chosen according to the “theoretical sampling” of GLASER & STRAUSS (1967). In each household qualitative semi-structured questionnaires were conducted by the concept of problem-concentrated interviews according to WITZEL (1989). Furthermore key informants in the villages and representatives of local and national organisations, mass media and consultant agencies on regional and provincial levels were interviewed by the method of expert talks. Additionally, the participatory method was incorporated into the data analysis.

Knowledge is not easily ascertainable, thus followings above mentioned theoretical basics were used and examined within the study: (1) school education, (2) lifelong learning through experiences and (3) individual knowledge through organised education. The exposure and classification of knowledge is only possible through the development of applicable indicators. Indicators to measure (1) and (3) emanate according to MEUSBERGER (1998, 2003), KAMP-SCHULTE (1977) and FRÖSE (1997) and were extended to subject matters. Indicators for measuring (2) lifelong learning through experiences, are based on criteria of the A1 household census 2004. To ensure the comparability of the data for further research, all points of interest were selected and discussed in arrangement with STORMA subprojects A5 and B2. The following analysis distinguishes between individual (in regard to environmental perception) and collective (regarding traditional knowledge) levels. Correspondently there are four elaborate chapters which results are discussed separately: school education, traditional knowledge, environmental perception and requirements for knowledge accumulation.

4. Village profiles by comparison

The basic research was conducted in two villages surrounding the Lore-Lindu National Park, Toro (Kecamatan Kulawi) and Bulili/Nopu (Kecamatan Palolo). Both villages have strongly opposed structures and history, which are summarised within the following.

4.1 Toro

According to the 2004 census Toro village consists of 522 households representing 2133 inhabitants on a total settlement area of 50.7 km². The administrative system is divided into seven parts, the so-called *dusun*. Including Toro, the whole Kulawi valley has a long settlement and cultivation history. The region has been characterised by a low immigration rate as

well as slight out-migration processes since the Indonesian independence in the 1950s. Regarding this aspect the region denotes a slow population growth. The average age amounts 26 years (A1 Census 2004, BPS 2002).

The population structure in the village profile is earmarked by a high diversity in both religion and ethnicity. Most inhabitants belong to the ethnic group Moma, followed by Rampi (originally from south Sulawesi) and Uma (Kulawi valley and proximate areas). Other ethnic groups like Napu, Toraja, Bada or Poso only represent a minor number of the Toro population. As a contradiction to FREMERY (2002: 12), the ethnic group of Bugis does not play a dominant role within the village context as only less than 0.4% are related to this ethnicity. Most inhabitants attribute themselves as Protestants, some as Muslims (A1 Census 2004). The predominant role of Christianity is specifically noticeable within the Kulawi area and is historically related to the cultural impact of the Dutch in the first half of the last century. Even though there is a high degree of heterogeneity, spatial or socio-economic segregation based on religion or ethnic belongings are not perceivable within the village structure.

The dominant cultivation and land use is based on rice in wet-field agriculture (*sawah*) and cacao as the primarily cash crop. Furthermore, coffee, seasonal mixed cultivation products and diverse horticultures are observable. Especially horticultures like vegetables and fruits, which are planted mostly in small gardens nearby the farmers' dwellings, do play an important role in the subsistence sector. Averagely every household owns at least two plots of land, covering an area of 0.25 – 1.0 ha (A1 Census 2004).

Almost 97% of all households own their fields as private property and live exclusively from agriculture. Besides just a few exceptions all household livelihoods are gained by agriculture, agro forestry, shifting cultivation and fishery. Generally, livestock assets as cows, pigs and buffalos do play a minor role. Including all characteristics, it can be summarised, that Toro is a traditional village, which is strongly determined by the historic development of the Kulawi valley, the diverse population structure and less migration processes (cp. FRAMEREY 2002).

4.1 Bulili

The Bulili village consisted of 947 inhabitants in 229 households in 2004. The average household size amounts 4 individuals by an average age of only 24 years (A1 Census 2004). The village shows a significant high population density, covering an area of only 12.8 km². The administrative system is structured into six parts. Since the mid 1980s there is a continuous population growth mainly due to migration processes. Generally, there is a high fluctuation of in- and outgoing migration noticeable within the last years. Bulili documents a relatively young settlement history, proved by only a few detectable houses along the side road in the 1960s.

The majority of all inhabitants belong to the ethnic group of Kaili. The second largest group are Bugis, who originally came from places in south Sulawesi. Other ethnic minorities are Uma, Toraja and Sunda. In contrast to Toro 80% of the population belong to the Islam, only 18.2% are Christians. Regarding the ethnic dimension of religion, the Bugis are exclusively Muslims, whereas the confession of other ethnic groups differ significantly (A1 Census 2004).

Land use is dominated by the cultivation of cacao, covering 85% of the agricultural land, and horticulture. The cultivation of rice is extremely low and therefore has nearly no impact on the agricultural structure of the village (BPS 2002). However, also the cultivation of vanilla is somewhat increasing. Additionally, maize is used for subsistence and as a pioneer crop for entering new plots for further cacao plantation, which is normally followed by shading trees for the protection of cacao. Subsistence products like vegetables (*ubi*, tomato and chilli) and fruits (banana, durian and *rambutan*) are planted in close proximity to living space in small gardens.

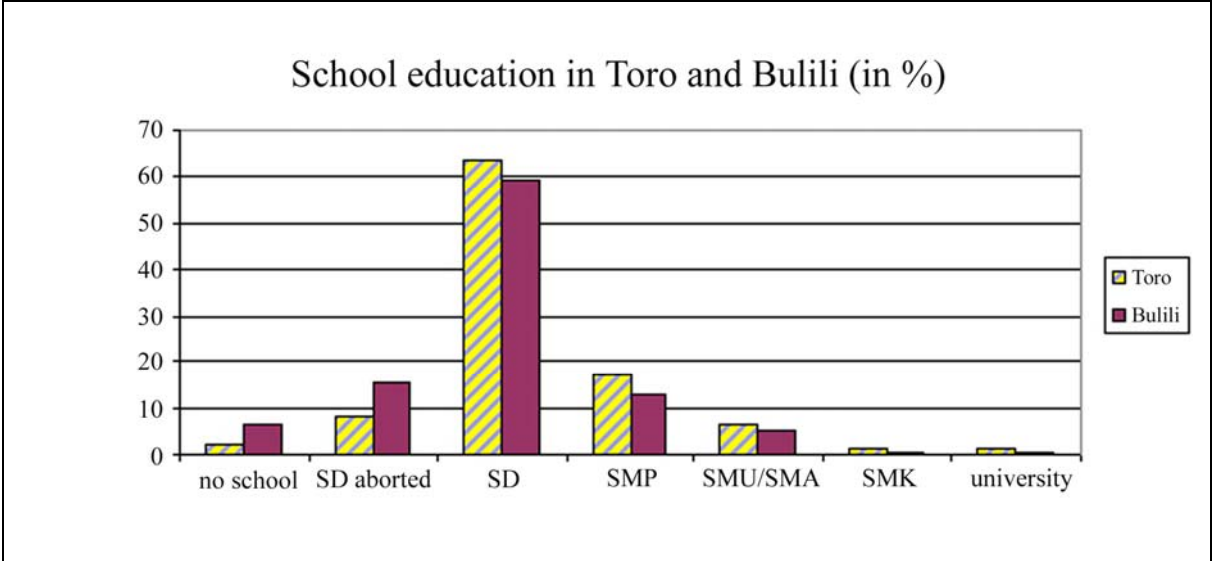
Averagely every household possesses one plot with an average size of also 0.25 – 1 ha. Plots are normally owned by the families as private property, renting systems only play an inferior role. More than 95% of all inhabitants are related to agricultural work which dominates all income generating activities (A1 Census 2004).

Summing up it can be mentioned that the Palolo region has significantly changed due to high fluctuation processes caused by in- and outgoing migration. This development has a strong impact concerning land use within the whole region. Bulili is therefore characterised by a high dynamic concerning migration and land use.

5. School education

Regarding the access to education there are no essential differences between the two villages perceivable. Furthermore, in both Toro and Bulili there is neither an appreciable disparity within the fields of religious or ethnic belonging nor by sex. Thus access to school education might be potentially accessible for all inhabitants. According to the averagely young population both villages have a significant high percentage of children under school age (17%) (A1 Census 2002). Generally, the level of education is considered to be quite low, even though positive achievements within the course of illiteracy reduction since the 1980s are mentionable.

Fig. 1: School education in Toro and Bulili – a comparative view



SD (Sekolah Dasar)= elementary school; SMP (Sekolah Menengah Pertama)= under secondary school; SMA/SMU (Sekolah Menengah Atas/Ummum) upper secondary school; SMK (Sekolah Menengah Kejuruan)= high school

Source: A1 Census 2004

Both Toro and Bulili include elementary schools, but higher education institutions are not existent. Therefore, children who want achieve higher education have to accept long distances. Even though the majority of all children graduate from elementary school successfully, only a few attend and finish high school or university. However the school education in Toro seems to be a little higher than in Bulili, due to higher percentages of pupils who attend elementary and secondary schools. Although statistical data doesn't state a clear trend, most people sense school education as very important for their future well-being. Despite very different educational levels of their parents all respondent estimate the value of school education as very high.

Based on a comprehensive research in Indonesia, the ASIAN DEVELOPMENT BANK (2003) states a strong dependency of the access to higher education facilities and the economic posi-

tion of households. Additionally, the above mentioned insufficient infrastructure of high schools and universities strengthen these effects as the accomplishment of long distances is strongly related to the financial situation of families. Therefore following nation-wide problems in the educational sector can be identified: missing quality of equipment, inflexible curriculum, high school fees, lack of teachers, regional disparities and a strong orientation on certification relevance. In spite of remarkable steps towards the reduction of illiteracy since the 1960s, national education policies still lack sufficient outcome (JAKARTA POST 10-06-2004; KARCHER 1996: 57).

However a correlation of age and educational background is noticeable within the research context. Averagely younger people received significant higher education than their parents did. This development is due to various reasons. On the one hand increasing prosperity secures more capital for educational investments, on the other hand the reform process of the school system achieved remarkable improvements concerning the education system and the general access to school infrastructure. Even though the research area is strongly characterised by the agricultural sector, it is further noteworthy that no fields of agricultural land use or environmental protection are part of the common curriculum in elementary and secondary schools. Only high and vocational schools like SMK provide special knowledge about environment related topics. Those respondents who graduated in agricultural programs reported excellent results in harvesting due to their achieved knowledge base and skills. However, in both villages only a minor proportion of individuals have a certified agriculture education background. In this regard agricultural knowledge is not primarily transferred by school education. Nevertheless school education reflects a noticeable, but not a significant aspect for agriculture land use decision making.

5. Cultural values- community and social organisation

Besides the formal educational system, cultural knowledge means the transmitted and traditional knowledge of a community. This particular knowledge base is conserved and can prosper by the coherence of village communities, traditional institutions or community authorities within a surrounding social framework. Additionally, cultural values on household level do also play a crucial role even though performing on a small scale level. Thereby the research focuses on the common pool of inner village knowledge on household level and its impact to land use decision making in a comparative view between both villages.

Generally, the primary agricultural knowledge is constantly passed on from parents to children. Regarding this certainty the specific role allocation depends on field activities. Both daughters and sons are taught in agricultural and household matters by their parents and family members. Nevertheless the comprehensive field of household activities is strongly related to women, whereas agricultural matters are dominated by men.² However, nowadays the noticeable equal treatment of both daughters and sons regarding their educational background can be valued as a tendency of a rethinking process within gender roles. This process might lead to a restructuring change in society and social life.

Specific aspects of knowledge can be determined covering a wide range of daily life needs. Especially knowledge about the healing power of plants play an ongoing important role in case of illness. Most mentioned are herbs and spices which usually grow in house gardens. It can be observed that a lot of people possess specific knowledge about medical plants. In Toro this knowledge is concentrated by so-called *dukun* people, medicine men or women. In Bulili the village function of *dukun* can't be asserted. Nevertheless the provision of medicine by a local kiosk plays a dominant role for people in case of illness. Traditional medicine is often

² Cf. Discussion Paper No. 24, Woellert et al. 2008

used for first aid and also related to the economic situation of households. In emergency cases the family calls doctors from Kulawi or Palu.

Furthermore traditional celebrations do play an important part in the field of cultural knowledge. This includes religious ceremonies and festivities reflecting the appearance of life cycle events (SOETARTO 2003: 10f). Most celebrations indicate the beginning of individual life phases, e.g. birth, start of adulthood, marriage or death. Additionally, specific festivities are also visible in cultivation cycles, like the annual Christian harvest festival *sykur*. The celebration of life cycle events and plantation periods is crucial in both research areas.

However, the forwarding of knowledge by older generations about local plants and animals is generally rare and interest is decreasing, although the parents and grandparents generation do own a wide range of specific traditional knowledge. Thereby the younger generation pay less interest in the surrounding environment in favour of recent problems and market-oriented matters. This occurrence is seen as a process caused by kinds of new media such as TV and radio, making more knowledge available. The decrease of non-profit knowledge underlines an economical-driven restructuring of knowledge patterns.

Generally, Toro shows a comparably high degree and further dispersion of traditional knowledge which is primarily based on a long settlement history and highly developed traditions. The conservation and dissemination of knowledge is guaranteed by numerous authorities and organisations. The revitalisation of traditional values and the movement of autonomy in local resource management supported by external village organisations illuminate the *lembada adat* new power and reputation (FREMEREY 2002). However in Bulili common social networks are developed rudimentary. Although there are religious and ethnic similarities, there is no common social background existent. Therefore traditional knowledge is concentrated on a small scale level households and families. Furthermore the knowledge pool is strongly related by religion and ethnic kinship. Thus the transmission of traditions has no ascertainable impact on village level.

Traditional knowledge is an important element for sustainable land use and assures successful management of natural resources. Though traditional cultivation and land use methods do offer security as well as economic and personal autonomy. This is mainly due to the fact that an actor of a social collective is not exclusively dependent on external help. The traditional organisational structure of one community plays an important role to protect the cultural heritage. The influence of traditional knowledge differs significantly in both villages and is also reflected in the general land use decision making process. Toro represents a strong organisational structure of distribution, storage and implementation of traditions throughout a historically-grown community and established village institutions. Bulili has no common social structure and shows a minor ability for the connection of cultural knowledge patterns due to an undeveloped village interrelation. Therefore the traditional knowledge pool of the Bulili community can be seen as rudimentary and restricted by household, ethnicity and religious borders. In addition to RÖLL (1979: 29), Bulili can be seen as a society in transition from a traditional to a market-oriented community. This development includes loosening of community behaviour, growing individualism, restructured power relationships between traditional village institutions and new elites, spatial mobility, economic-oriented thinking and an ongoing change from subsistence to a market-driven economy. A weak inner village organisation structure accompanied by high fluctuation of population and a huge spatial spreading of settlements avoid a successful development of a common social system within a village context.

It is indisputable that external influences and economic interests play decisive roles despite the traditional system. Traditional values and standards are conducive for the cohesion of a social community. The consideration of traditional knowledge by households and single actors is strongly related to the individual well-being and advantage. However, strong social

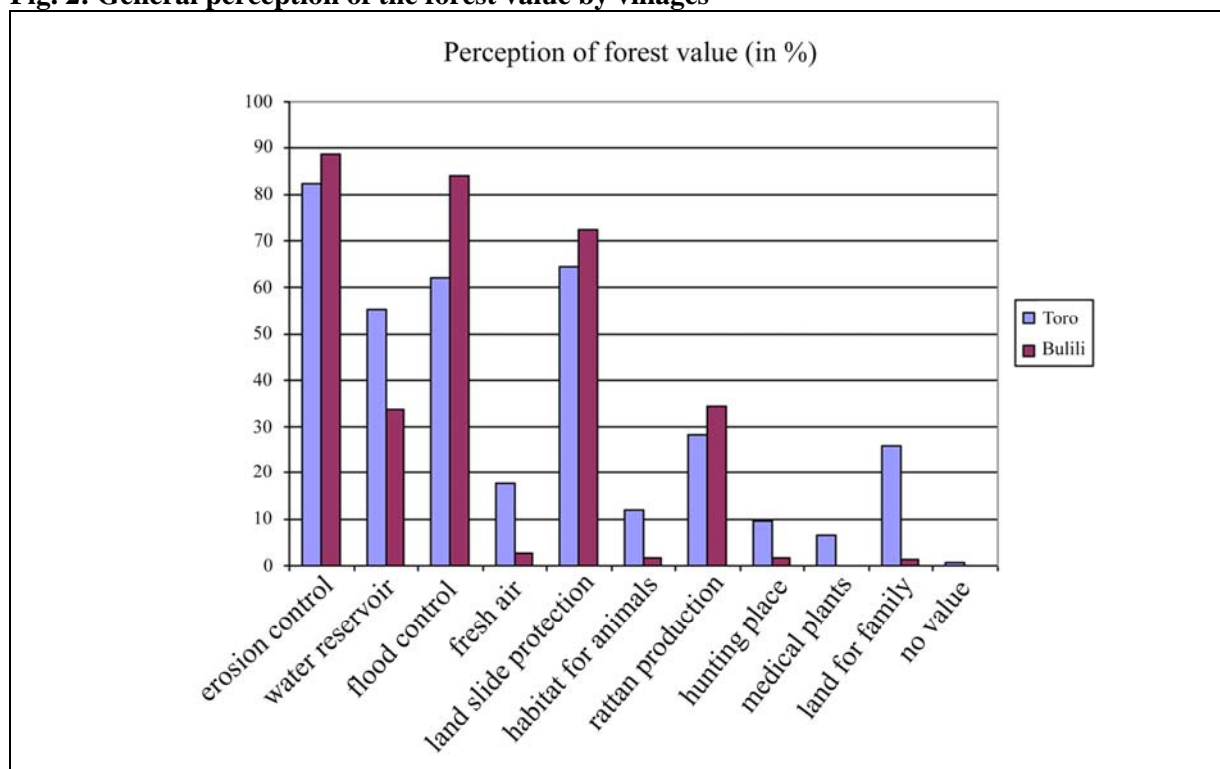
networks between inhabitants and organisations in Toro alleviate varieties of information distribution which contribute to the development of all inhabitants and make villagers respect their local values and standards as well as their natural environment.

6. Environmental perception

The perception of the surrounding environment complements the field of cultural knowledge and shapes awareness about natural characteristics within regions. Furthermore environmental perception plays a decisive role especially in fragile ecosystems towards the exposure of limited natural resources and sustainable use. On the one hand knowledge about nature is strongly related to personal observation and experiences, on the other hand it is deeply dependent on cultural values and standards and mediated by the social environment.

According to BIRNER & MAPPATOBA (2002) the general consideration of forest basically follows an analysis of its direct use potential. Thereby forest is perceived for protection against erosion, floods, lack of water and extraction of lumber. The actual ecosystem has minimal value in Toro and even less in Bulili. The villagers' perception and awareness can result in a dichotomy of present and future expectations. In Toro the forest is perceived as a source of fresh air, but also as a potential cultivation area.

Fig. 2: General perception of the forest value by villages



Source: A1 Census 2004

The perception of endangered species is reduced to the nearby environment of agricultural land and measured by its potential current use. The majority of all respondents perceived no change in flora or fauna during their life time. However people in Toro remarked the absence of certain medicine and forage plants while this was not the case in Bulili. Additionally some mentioned a light decrease of dears and wild boars within the LLNP. This decrease is confirmed by national environmental protection agencies. Lately the overall stock of species diversity stabilised noticeable within recent years.³

³ Interview with TNC in Palu (2004).

As environmental perception mainly concentrates on the vicinity of agricultural land, knowledge about pests plays an important role in the everyday life of the people. The handling of informations about related effects can be used to analyse known species, traditional and modern methods of control and potential conclusions for a sustainable system in the future. As one of the most dangerous kind of pests parasites on cacao plants were identified by the respondents. The A1 Census 2004 detected the caterpillar (*ulat*) and PBK⁴ insects as the main pests within the region. The highest damage caused by these species is noticeable in the village of Bulili, while in Toro the interviewees perceived less impact. Generally, the impact of parasites is rated as very high compared to other pests like rats, etc., this is mainly due to various levels of damage, including effects to fruits, roots and leaves primarily of cacao and coffee. Even though a lot of respondents are aware about this phenomenon, only a few can identify the insects by name or have comprehensive knowledge about it. Unlike the concentration of insects is strongly related to coffee and cacao plantation, rats can be detected everywhere around the fields. In Toro rats have extremely high impact on rice plantation and are therefore rated as a big pest. However, the appearance of rats arouse wide spread reactions from “dangerous” to “existing, but not excessively marring”. The different estimations of pests are basically due to different economic values of various crops. While cacao is the main cash crop which determines the family income, rice is often recognised as subsistence food supply.

For pest control farmers prefer traditional, natural techniques for all agricultural cultivation. These methods include the protection of plants by cleaning the fields, harvesting on an early stage of the production cycle, removing bad fruits and cutting the branches to let more sun light to the soil. The respondents who attended field school or further agricultural education know this method by the name of PSPsP⁵. This specific concept is mainly used to combat PBK. Additionally, the use of pesticides is quite common even though it is related to high costs. The amount of people who use pesticides is much higher in Bulili than in Toro. This is strongly related to the widespread cacao mono cultures in Bulili, which supports the dispersion of pests. In Toro a similar development is impeded by a higher diversity of cultivation products. Generally the use of pesticides is promoted by national consultant agencies or chosen by the farmers themselves rather than through active village organisations. Furthermore the application itself is based on the individual persuasion to effectively control the pests as well as a result of the actual absence of professional information sources. Pesticides are particularly used for ants, rats and larvae. However, pesticides are often criticised as ineffective and unsanitary and farmers use it instead of the consideration of other solutions.

Professional knowledge about natural procedures in general plantation activities is a basic category to analyse the degree of environmental perception. Even though pollination is one essential procedure within cultivation cycles a lot of the respondents do not know it under the professional name *penyerbukan*. Villagers’ rather prefer the term “marriage of plants”. All in all a growing interest on illumination and examination of natural procedures is noticeable, but this also due to a low level of informations about natural processes on the interaction of plants and animals. Comparatively, in Bulili more awareness about these processes can be detected. However, special strategies to allure potential pollinators like ants, birds or bees are not used in the research areas. For the majority of all respondents neither ants nor birds are seen as important for pollination and multiplication of plants. On the contrary ants are generally treated as pests. Knowledge about pollination is rare and mostly dependent on professional experiences. Regarding this issue, specialised knowledge does not play a significant role in both villages.

⁴ PBK = *penggerek batang kakao*.

⁵ PSPsP = panen sering (continues harvesting), pemangkasan (pruning), sanitasi (cleaning), pemupukan (fertilisation).

The general perception of environment has also to be considered as a part of (agricultural) knowledge that influences the comprehensive land use decision making process in the research area. Hereby a close interaction of environment and society needs to be taken into account. The consideration has to regard the human being as a part of his social-physical environment, who is a reciprocally embedded element within the natural context. Thereby, land use decision making in the research area is predominantly based on experiences. These knowledge patterns are strongly related to household or village level. The majority of respondents interfered to a strong use oriented perception of their environment.

Even though global trends of economising the natural environment are visible in the research area, the connection between the society and nature is still determined through a strong impact of traditions, institutions, values, standards and cultural influenced behaviour. A sustainable use of local natural resources is notably taken into account in smaller communities, such as villages with strong social networks. In addition to PANGAU (1998) the image of nature as a self-regenerative system can predominantly be adhered in communities with a long settlement history in the research area. In a comparative view between the two villages the high number of migrants in Bulili is responsible for weak social networks causing low communal awareness of environmental issues. Therefore land use decision making processes are more economical orientated. The overall perception of the environment varied strongly between persons and households due to personal backgrounds and experiences. The potential influence by social communities, single actors or organisations can be rated as very high.

7. External information sources

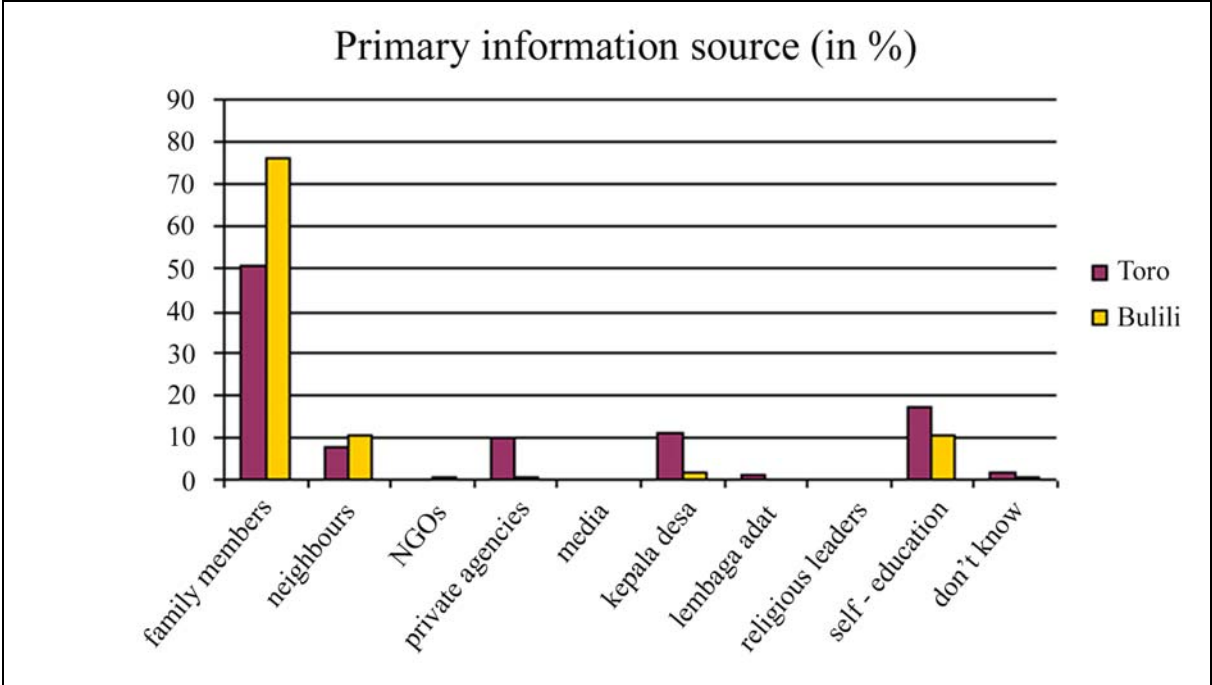
The foremost information source to achieve agricultural knowledge is the nuclear family or household (cf. Fig. 3). In both villages the family cohesion is particularly important for all respondents. Additionally, informal informations shared by neighbours are quite common, even though these are strongly related to specific targets. Furthermore, in Toro small group discussions focus on conflict management to solve problems within the village community, hold by the inhabitants themselves or by local professional consultants. In Bulili farmers try to solve conflicts by themselves rather than consulting authorities, friends or neighbours. If access is available, farmers from this village try to consult experts and professional institutions from outside the village. Thereby they prefer to ask family members living in Palu rather than unrelated inhabitants from their village community. Also informations about the current market situation are generated personally, whereas in Toro village networks play a dominant role regarding knowledge generation. However the connection to village authorities is strongly depending on personalities, skills and the personal relationship between actors. Local authorities can rarely be characterized by higher school education, but by their age, personal experiences and wisdom. Key actors play a decisive role regarding rethinking processes of agricultural decision making.

The Kulawi village can be characterised by various governmental and non-governmental activities which are visible by numerous organisations. Therefore the information diversity of education, environment and agriculture is highly multifaceted in comparison to the valley of Palolo. In Bulili most governmental organisations focus on the increase of agricultural production, including the provision with seeds and fertilizer. Additionally, non-governmental organisations (NGOs) like SUCCESS Allianz give training courses for more effective cultivation methods. The general influence of institutions can be regarded as sophisticated. In Toro government institutions do mainly provide general informations. NGOs basically focus on the conservation of the surrounding habitat and cultural values. But a lot of farmers would prefer the raise of agricultural production rather than achieve more information about the ecological or cultural environment. Hence in Toro communications regarding this aspect are primarily hold by neighbours or in official meeting points in the village. Even though the higher density

of governmental and non-governmental organisations makes it generally easier for Toro people to access basic informations, but there are high inequalities within the village community. Nevertheless a brisk exchange of various village groups and households exists. Further individual education is perceivable for only a few villagers in Toro. Within a social community, characterised by various organisational activities, individual initiatives and efforts seem to stay behind the common welfare. It is even unusual that an individual decides alone about land use change. Thereby the collective orientation can restricts individual knowledge and experiences regardless of the educational background of an actor.

In a comparative view, the internal village structure in Bulili is less used by actors for gaining informations. As in Toro also in Bulili family members are the foremost information source. Consequently the educational background of single actors and their families are the most important element for knowledge accumulation. The sources of knowledge are basically situated outside the village. The village structure is the overall basis for informal conversation, but it is seldom used for general problems or education. Individual interests are subordinated by the general village interest. Professionals in certain agricultural fields among the villagers are mostly rare (e.g. vanilla experts) and the access for information is not equally open for everyone, constrained by social structure, origin and the location inside the village. An internal consulter like a representative of the PPL⁶ does not exists in every village. Besides strong family relations individual knowledge gained by external sources is increasingly important. These informations concern aspects like the cacao price fluctuation in Palu and other relevant topics of agricultural knowledge. For a lot of people the access to capable information sources is problematic due to a lack of personal connections. Thereby the social community plays a minor role in economic concerns. The exchange of information seems to decline related to an increase of well-being.

Fig. 3: Primary information sources for individual actors by villages



Source: A1 Census 2004

The total number of radios and televisions is perceptual higher in Bulili than in Toro, but do not exist in many households in both villages. These living standard elements are primarily used for entertainment, but also partly as an information source. Sometimes farmers carry ra-

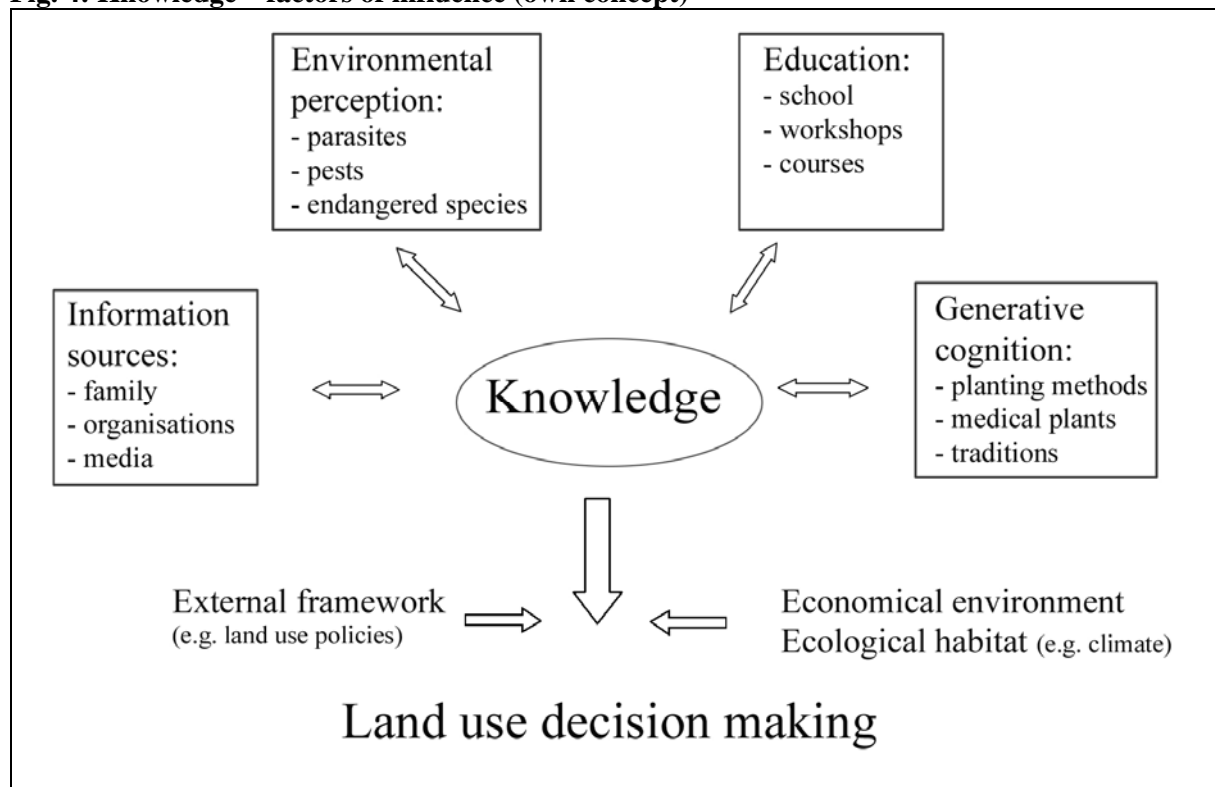
⁶ Petugas Pertanian Lapangan (PPL) = governmental agricultural consultant organisation.

dios to their fields to have both entertainment and news. The agricultural governmental radio programme RRI (Radio Republica Indonesia) and smaller radio stations like RCP (Radio Citra Pentanian) offer advice and informations about technical products, market prices and pest controlling. The programme is very popular and a lot of respondents stated that they constantly listen to RRI. Generally, both radio and television play a minor role as a information source for agricultural use and a rather used for entertainment. In a concluding consideration about the acceptance of various information channels for agricultural decision making the family can be identified as the most important initiator within the whole research area.

Conclusion

All above mentioned results underline the impression that land use decision making processes are only conditionally ascertained by knowledge as defined in this paper. However the presented findings do not allow a general, sweeping conclusion in specific regard to the impact of knowledge due to the necessity of a profound view. Thereby various components of knowledge need to be distinguished and analysed according their impact on land use. The scope of school education, cultural values and the separately focussed topic of environmental perception and individual knowledge accumulation were analysed in the two villages.

Fig. 4: Knowledge – factors of influence (own concept)



The analysis of both quantitative and qualitative data proved that there is only a weak relation between the field of school education and land use decision making. Thus this section of knowledge can not play a decisive role as an important cultural impact on land use change whether in Toro nor in Bulili. Regarding this aspect other components like traditional knowledge, environmental perception and external information sources need to be considered. In Toro cultural knowledge has the strongest impact on decision making processes and land use change. This is predominantly due to strong village institutions and the organisational structure on the basis of a historically grown development. The continuing revitalisation of cultural knowledge leads to an internal village coherence. Local authorities and organisations support the compliance, assurance and transmission of traditional values.

The dynamic and relatively new founded settlement of Bulili records a high density of migrants. The land use decision making process is particularly based on individual knowledge generation by external information sources. This is mainly due to the migration background of a high number of inhabitants who came from various areas of Indonesia. The majority of all residents came to Bulili within the last ten years. Concerning this matter no noticeable recognition of environmental perception and local knowledge can be detected. Only a few possess historically-grown traditional knowledge. The foremost motivation to gain more knowledge is basically market-oriented and focuses on the plantation of cacao monoculture, which promise more income and was therefore the primarily reason for settlement. Additionally in Bulili only a few formal consulting places and official discussion rounds exist. Thus knowledge about agricultural techniques, methods and the interaction with the physical environment is just accessible for a narrow ambit. The transmission of knowledge is hereby restricted to the household level, nuclear family and ethnic group.

The most striking differences between the two villages regarding their knowledge-based land use decision making process can be stressed out between use, conservation and expansion of cultural and individual knowledge. In Toro the transmission of knowledge within the village and social coherence is dominating. This can only partly be found in the individual knowledge accumulation process of a single actors regarding land use in Bulili. However both aspects do not generally contradict each other but the crucial impact on land use change is postponed by a lack of social and organisational structures from a collective knowledge generation to a reinforced individual accumulation and appliance of knowledge.

Final Statement

The sector of school education shows an idle potential regarding knowledge intermediation. This matter of fact might change in the future as parents continuously mentioned the ambition to send their children to high schools for a better educational background. Furthermore the respondents showed an increasing demand for consulting and information services provided by government agencies or private organisations. The obvious need for a wider range of knowledge sources indicate changes in potential knowledge transmission and assign new tasks to national and regional development strategies. These changes might also been pushed by noticeable problems in agricultural land use, which do partly result by a lack of traditional knowledge generation and do therefore underline the high demand for consulting agencies, to which access does not exist so far.

Individual knowledge accumulation is attached to a growing impact of diverse media, especially the radio. So far agricultural programmes do exist only rudimentary, but this is also accompanied by a lack of infrastructure. Concerning the relationship of human and environment, which was mentioned in the introduction, it can be confirmed that the sustainable use of resources requires ecological and socio-economic stability. The empirical study proofs that social stability is strongly related to traditional knowledge and can be supported by a strong organisational infrastructure of a community. Hence a sustainable use of natural resources including land, water and forest is manageable in Toro. Comparatively Bulili represents an unbalanced relation of social and communal aspects. This intensifies a lack of sustainable resource use caused by inhomogeneous land use decision making. The stability of a fragile ecosystem, like the margins of the rainforest region of the Lore Lindu National Park, can therefore achieve greater resistance when knowledge generation gets enhanced based on communal strategies.

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