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Risks, resources and reason: understanding smallholder decisions around farming system interventions in Eastern Indonesia

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Abstract

Adoption of new cattle management practices by Indonesian smallholders occurs less as a 'technology transfer' in the classical sense but rather as a series of conscious decisions by farming households weighing risks and resources as well as matching innovations to livelihood strategies. This paper uncovers the context of decisions and communication of innovations by way of social networks. The research looks at two geographically distinct cases where new cattle management practices have been introduced. We apply the lens of a *common sense* framework initially introduced by Clifford Geertz. Smallholder decisions are analysed within a socio-cultural context and a particular set of resources, risks and livelihood objectives. We show that the respective value placed on land, cattle and food security is central to adoption of new cattle management techniques. Far from accepting everything novel, smallholders are selective and willing to make changes to their farming system if they do not conflict with livelihood strategies. Innovations are communicated through a range of existing social networks and are either matched to existing livelihood strategies or perceived as stepping-stones out of agriculture.

Keywords: adoption, common sense, decision analysis, Indonesia, smallholders, social network analysis

1 Introduction

The research for this paper stems from the need to learn more about how decisions are made and mediated when farm management innovations are introduced to a subsistence-oriented agricultural society. The research centres on a qualitative analysis of household decisions and decision influences through social networks in response to introduced information about improved cattle management in South Sulawesi and Central Lombok—two geographically distinct areas of Indonesia.

Modern economics acknowledge the issues attached with the *homo oeconomicus* assumption of people acting as 'selfish rational actors' (Janssen & Anderies, 2011, p.1569). Instead, researchers face the challenge of uncovering the context of decision-making, which "*requires the development of a framework that specifically captures context. Furthermore, this requires the development and application of methods to measure this context, such as social networks, mental models and communication patterns*" (*ibid.*, see also Anderies *et al.*, 2011). Understanding smallholding household decisions is imperfect - neither do they accept everything novel because they are destitute; nor do they reject innovations because they are conservative or illiterate. Rather, smallholders use culture to mediate social action, and institutions to filter their choices. Far from being 'irrational', they are rational in considering the social ramifications of change.

The research presented here subscribes to the call for a departure from the rational actor paradigm when designing development research or agricultural extension interventions. The farming household's decisions

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and actions occur in a cultural and social environment, for which the household has developed skills, techniques and knowledge to navigate through. The argument articulated here supports the notion that development interventions cannot assume to be designed on a white canvas, or within an economic balance sheet. Rather, household decisions are based on *common sense*, or encultured knowledge, which is, in essence, an adaptation strategy to the historic and current socio-cultural context (Geertz, 1975, 1983).

1.1 Farming systems and decisions

Any farming activity occurs within a system constrained by social, physical and economic resources (Giampietro, 2004). Changes to one part of the system will most likely have an impact on other parts, i.e., require adjustments by several elements in the system. In largely subsistent smallholder systems any adoption of a new practice is most likely to have an effect on land and labour demands, division of labour, and input/output ratios. However, we cannot assume that farmer decisions are based solely on rational choice as other factors, such as social pressure, cultural norms, aspirations, and risk perception feed into the decision (Douglas, 1985).

The *homo oeconomicus* model of classical economic theory assumes an independent agent who acts rationally with the objective to maximise self-interest. It usually assumes full access to relevant information (*cf.* Reeson & Dunstall, 2009; Mzoughi, 2011). Newer theory building in behavioural economics, however, has identified several 'anomalies' under which rationality is discarded for the sake of other goals, such as avoiding risk, minimising losses and the unwillingness to change between different activities within the potential livelihood portfolio. In addition, the relevance of institutions, social preferences and norms has been acknowledged. For example, conditional cooperation and equity as guiding values when making decisions (*ibid.*).[1]

In fact, recent research relates adoption decisions mainly to social and moral concerns, rather than economic ones. Mzoughi (2011) differentiates between intrinsic and extrinsic motivations; intrinsic being the satisfaction of personal standards and extrinsic being social acceptance and reward. The field of economic anthropology (e.g., Rössler, 1999) tends to focus on non-economic rationality, i.e. benefits (material and social) outside of the monetary realm.

It seemed relevant for our study to look into the *cultural system* of decision making. Therefore, we took a heuristic approach following the seminal works of anthropologist Clifford Geertz (1975, 1983). The interpretative – rather than functionalist – approach of his framework lies on understanding the *emic* or inside perspective of the decision rather than focusing on its results. It captures the different steps involved in the process of decision-making. The analysis of common sense, according to Geertz (1983, 75f) requires focus on *perception* – rather than objectified reality – *assessment*, *judgement* and *conclusion* when dealing with everyday problems within a given cultural setting [2]. Naturally, such an approach is highly contextual and merits a number of case studies of decision-making processes: by looking at institutions, influences and resource constraints of each case, decision patterns emerge.

Geertz' notion of *common sense* emphasises the importance of understanding the knowledge *commonly* shared in the social system and how the system reacts to perturbations of new knowledge for which there are no indigenous (pre-existing) concepts. When exposed to everyday phenomena, people are able to perceive information and process it in a sensible, intelligent, comprehensive and reflexive manner and respond appropriately and efficiently. Common sense responses affirm the cultural system. They also provide guidance when making everyday decisions and evaluating risk. Common sense is based on knowledge of the immediate environment that ensures household survival through everyday challenges. It is specific to culture and environment and constantly (re-)negotiated among the culture bearers. It is democratic (i.e., everyone can/should have it) and serves as a guide when specialised knowledge is lacking (Geertz, 1975, 1983).

The fields of development studies (e.g., Ellis, 2000) and ecological anthropology (e.g., Ellen, 1982) similarly observe the systemic nature of farming and the multi-layered decision space under which the household operates. Within this framework, household decisions are influenced by the following factors (see also Figure 1):

[1] Conditional cooperation and equity are analogous terms to redistribution and reciprocity in economic anthropology (Polanyi, 2001; Rössler, 1999).

[2] We have used these categories to guide our interviews for understanding how respondents arrive at their decisions. In addition, we added another category of inquiry, which was *implementation*, assuming that any decision does not necessarily lead to the desired action. Geertz (1983) does not mention implementation, since he is interested in shared knowledge systems that lead to the notion of common sense.

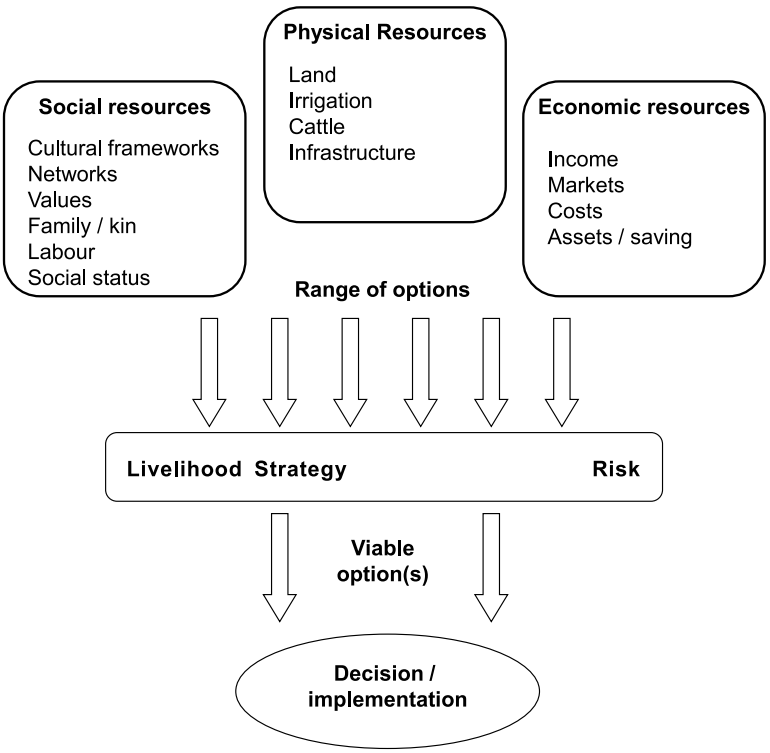

Fig. 1: *Interaction of resources, risk and livelihood strategy in the household decision-making process. (authors' own).*

- available resources which determine the viable options for the household's activity portfolio;
- household livelihood strategies;
- household perception and evaluation of risk.

Resources are defined here as material and immaterial assets enabling the household to select among different options depending on how the resources are applied or expended. Resources available to the household and expected economic effects determine the viability of options. When evaluating options, households select within the relevant institutional and cultural context. This includes social networks and institutions, which mediate how information is spread through the community and influence the interpretation of information (Preston, 1994; Wiersum, 1994).

Within the household, *livelihood strategy* as well as its evaluation of *risks* significantly influences the selection of new practices (Ellis, 2000; Sjah *et al.*, 2006; see Figure 1). Both livelihood strategy and risk evaluation are based on the *perceived* availability of resources which the household is endowed with. This is where the common sense notion comes to play. Only those resources, which pass the social filter and are deemed appropriate for application, become part of the decision process. Perceived resources are those commonly shared within the system (*cf.* Pastore *et al.*, 1999).

1.2 Supporting cattle management in Eastern Indonesia

Holding large ruminants (buffalo and cattle) is a traditional ancillary activity of rice farmers in South East Asia (Devendra & Thomas, 2002). While the priority lies on the production of the staple crop, cattle are often held if there is additional land and labour available on the farm, and are particularly important for smallholder farmers (*ibid*.). Most farming households show a strong preference towards securing food stocks with rice, vegetables, and poultry (Pengelly *et al.*, 2003). Cattle, while rarely consumed within the household, are traditionally used as food source for larger festivities, such as weddings, and shared among relatives and neighbours. Additionally, cattle are bred, fattened and eventually sold off to traders or at local livestock markets where they mostly end up satisfying the growing beef demand in regional cities.

While cattle are generally not important for securing the farming households' food supply, they nevertheless fulfil an important socio-economic role in the farming system. Research has shown the multi-functionality of large ruminants in traditional Southeast Asian societies – as animal labour in cropping and transportation, as emergency protein source, as a symbol of status, as storage of wealth, and as cash savings for large invest-

ment needs (Devendra & Thomas, 2002; Paris, 2002; Mayrhofer-Grünbühel, 2004).

In eastern Indonesia, cattle are fed by either (a) tethered grazing on rice bunds, small patches of otherwise unused land and on the banks of waterways or (b) left to graze freely on harvested paddy fields or secondary forest. Stables or pens are used to protect cattle from natural hazards and cattle theft during the night. Supplementary manual feeding may occur if naturally available forage is insufficient. In this case, locally available forages, such as elephant grass (*Pennistum purpureum*) is used, which is either gathered from places where it grows wild or planted around the homestead.

The focus of our analysis is two livestock research projects in Lombok and South Sulawesi, Eastern Indonesia. The aim of these projects was to adapt techniques for improved cattle management and allow for a more rapid turnover and more secure income stream for smallholding famers (see Table 1; and, for more detail, van Wensveen *et al.*, 2010, 2011). Interventions included introduction of new forage varieties, strategic forage production, feed budgeting to improve cattle nutrition and health, as well as controlled mating and weaning to enable higher fertility rates. The newly introduced practices can be roughly separated into (1) practices requiring complementary resources and (2) practices requiring behaviour change only. Suggested practices support intensification by keeping the cattle in or near pens and planting forages. The emphasis, thus, shifts from predominantly free grazing to manual feeding.

The introduction of improved cattle management techniques in the two projects has been deemed widely successful (Martin, 2010) and a large number of households adopted one or more of the introduced techniques (455 known households in South Sulawesi, and 1,030 group members – out of a total 1,144 – in Lombok; for details see: van Wensveen *et al.*, 2010, 2011) [3]. The evaluation of uptake, however, revealed that the adoption of techniques by households was highly selective. Therefore, effort was put into understanding the social process of adoption, which is presented here.

We attempt to contribute to an understanding of household decisions under the conditions of constrained resource access. This is informed by the insight that culture and the social environment mediate the common understanding of how to manage the farming system. We seek to elucidate the smallholders' rationale – their *common sense* – of making changes to the farm system when exposed to new information and resources by providing a contextual description of the adoption process. This coincides with increased attention to the role of the smallholder in agricultural development (Wiggins *et al.*, 2010) and contributes to an understanding of the rural economy and decisions made under the uncertainty of system effects caused by introducing new practices in resource constrained environments.

2 Method

To understand household decision processes, which determine whether or not adoption takes place, *decision narratives* were developed. These provide insights into the livelihood strategies of households as well as the various steps in decision-making. Narratives were developed from in-depth interviews, which explored the various steps of deciding whether or not to accept new livestock management practices. To make them comparable across locations and contexts, the interviews were structured according to Geertz' (1975) categories of common sense [4] and, more specifically, along the analytical framework described above (*cf.* Figure 1). The categories enable outlining the perceptions, risks considered, and persons involved in the decision making process and identify relevant institutions and drivers.

The decision to make changes to the farming system does not occur in isolation of social relationships. Rather, there is a process of (formal or informal) exchange with other actors and institutions such as neighbours, village heads, religious leaders, government agencies – all of which feed into and possibly influence – the decision-making process. In fact, for development interventions to be successful, more attention needs to be paid to accessing and building links with existing networks (Mahanty, 2002).

Social Network Analysis (SNA) was used to analyse the spread of information and explore actors and institutions influencing household decisions. SNA allows for analysis of the structure and composition of social connections and subsequent implications on access to information or resources as well as the articulation of norms, and values and behaviour (Wasserman & Faust, 1994). The structure and context of social networks can highlight access to (or lack of) information and resources as well as the factors supporting decision-making (Lai & Wong, 2002; Hoang *et al.*, 2006).

[3] The projects have been completed and approved by the commissioning agency. The research presented here represents a comparatively small activity within the project.

[4] See our interpretation of Geertz' (1983) categories under *Farming systems and decisions*, above, as well as footnote 2.

Table 1: *Table 1: Summary of introduced practices for each area. Slight differences in recommendations reflect adaptations to local conditions and priority of implementation in each region*

Lombok:	***South Sulawesi:***
1. *Controlled mating* Bull service facilitated through the *kandang* group; aims at mating once yearly.	1. *Better use of existing forage* † Improved management of forage to ensure productivity.
2. *Preferential feeding for pregnant and lactating cows* Requires additional forage for cows.	2. *Introduction of new forages* ‡ Planting and management of new varieties on farmland or backyard plots.
3. *Early weaning and preferential feeding for calves* Requires pen to separate cow and calf, and quality forage for calves.	3. *Controlled mating* Aims to time mating so that the calf is born during the wet season when more feed is available. No bull provided through project.
4. *Forage management* * Requires management of forage on communal land or on dedicated farmland.	4. *Early weaning and preferential feeding* Requires pen to separate cow and calf, and quality forage for calves
	5. *Feed budgeting* Meeting anticipated forage demand throughout the year

* Forages newly introduced to Lombok included Mulato (*Brachiaria hybrid* cv Mulato) and Panicum (*Panicum maximum*), pre-existing forages included Leucaena (*Leucaena leucocephala*), Gliricidia (*Gliricidia sepium*), Elephant Grass (*Pennisetum pupureum*) and Sesbania (*Sesbania grandiflora*). For both, the focus was on forage management.

† Existing forages in South Sulawesi included Gliricidia and Elephant Grass.

‡ Introduced grasses in South Sulawesi included Paspalum (*Paspalum artatum* cv Higane), Mulato, Panicum and Setaria (*Setaria sphacelata* cv Narok). Introduced herbaceous legumes included Clitoria (*Clitoria ternatea* cv Milgarra), Centrosema (*Centrosema pubescens* cv Cardillo) and Stylo (*Stylosanthes guianensis* CIAT 184, *Stylosanthes scabra* cv Seca, *Stylosanthes hamata* cv Verano).

In this study, SNA was used to examine how knowledge about new practices spread among households and communities as well as the type of households, relationships or institutions critical for promoting adoption (Bandiera & Rasul, 2006; Crona & Bodin, 2006). The underlying assumption is that communication through cultural institutions would be more efficient than communication of knowledge introduced by external project staff. Data for SNA was collected as part of the decision narratives and focused on capturing:

- Interactions and influence between households and local institutions;
- The spread of information; and
- The spread of resources as concomitant to information.

Respondents were asked questions to determine if and where they heard about new cattle management practices; who they had discussed the practices with, and if/how they were able to obtain resources to support adoption, such as cuttings or seeds for forage. Different types of networks constitute inherently different ties or relationships between actors (Bodin & Crona, 2009).[5] Interviews sought to reveal the nature and effectiveness of different networks for the spread of information. Data collection included both volatile as well as institutionalised relations, i.e., both the exchange of information as coincidental part of people's every day interactions, and part of the regular flow of information by the project, with the aim of identifying patterns of information and resource flow in the target community [6].

Key challenges in SNA relate to definition of analytical boundaries (either geographic or relational) and sampling strategies. Scott (2000) highlights a range of strategies depending on the focus of analysis, each with its own limitations and requirements for justification. In our case, working at a village level (and in multiple villages) meant it was not feasible to include all households within a village in the analysis. Instead, we used snowball sampling, starting with a sample of households, which the project had been communicating

[5] For example, formal associations *versus* kinship ties.

[6] The project, of which this research was a part, shared limited resources (forage seed and mating bulls) among target farmers. Resources were not "handed out", however, but were one part of the communication package containing information on suggested practices. Therefore, the possible cases measured distinguished between the transfer of "information only" or the combined "information + resources".

with. We asked them whom they had provided information and resources to. A sub-set of these "scale-out" households would then be invited to participate in interviews. An equivalent number of households were also selected randomly and invited for interview.

The method used creates inherent limitations. For example, in a network created from snowball sampling, it becomes irrelevant to analyse the connectedness of the network as it is, by virtue of the sampling technique, highly connected (Scott, 2000). At the same time, the networks in this study represent only a small fraction of the relations present in the village. Nevertheless, rather than representing *minutiae*, the objective of the method was to arrive at an *orientation hypotheses*, which would allow us to understand selected relations between actors and provide more insight in the structure of information dissemination throughout the community (Schweizer, 1988)[7].

The two methods applied, decision narratives and network analysis, allow for observation of the structural-institutional as well as the cognitive-emotive aspects of processing information within the community. Hence, the results not only contain a formal analysis of relations among actors but also elucidate the process of evaluating risks and adapting livelihood strategies by households as their environment changes through the project intervention.

The study observes two cases in Eastern Indonesia, which differ substantially in terms of their agricultural systems, socio-economic characteristics and cattle management. One is characterised by single cropping, extensive livestock husbandry and a relatively low human population density, while the other is a (relatively) intensive farming and husbandry system with high population density (more details in results section, below). A total of 216 interviews were conducted in South Sulawesi (Baru, Bone and Gowa Regencies), and 80 in Nusa Tenggara (Central Lombok Regency) between July and November 2009. For the main characteristics of each Regency see Table 2. Interviews included respondents directly involved with the project, as well as those with limited or no involvement.

[7] The »orientation hypothesis« does not make strictly valid statements of relations between network variables. Rather, it identifies important phenomena within the network, which need to be considered when developing stringent hypotheses (Schweizer, 1988; Kelle, n.d.)

3 Results

3.1 CASE STUDY 1: Central Lombok, West Nusa Tenggara

3.1.1 Resources

Central Lombok shows high population density of 709 people per square kilometre (see Table 2). Landlessness is a common feature among rural households. On average, smallholders in Lombok who own or rent land have access to less than 0.3 ha (Table 2). As a result, spare land for grazing or forage production is limited.

Constraints on the available land area in Central Lombok limit the potential for adoption of practices that require additional land, such as forage cultivation. Available resources in the farming system do not allow for a significant increase in land used to grow forage without corresponding adjustments to other types of land use, such as replacement of other crops or land purchase.

Table 2: *Comparison of population density and household resources, Nusa Tenggara Barat and Sulawesi*

Province	*Regency*	*Population Density* (people per km^2)	*Paddy land* (% of regency)	*Estimated average paddy land ownership per household* (ha)*	*Estimated average cattle ownership per household**	*Average paddy land of households interviewed* (ha)†	*Average number of cattle owned by households interviewed*†
Nusa Tenggara Barat	Central Lombok	709	43	0.28	0.3	0.25	2.6
Sulawesi Selatan	Baru	135	13	0.70	1	0.74	5.5
Sulawesi Selatan	Bone	153	24	0.38	0.7	1.13	6.6
Sulawesi Selatan	Gowa	311	21	0.28	0.3	0.60	4.1

* Average calculated based on total number of households in regency – therefore includes non-farming households

† Based on household interviews conducted in 2009-10, includes landless households

Source: Lombok data is for the year 2009, taken from the BPS – Statistics Lombok Tengah Province and DINAS Peternakan. Sulawesi data is for 2006, taken from the BPS – Statistics Sulawesi Selatan Province.

Cattle theft has been a significant problem in Central Lombok and a system of communal pens (*kandang*) was established in the 1980s to address this. Large sheds with multiple individual pens are used by a group of households from one or several communities. Cattle are taken out to graze during the day, and are returned to the pen each night, where group members take turns guarding to protect against theft. Each member is required to pay a fee (rice or cash) and participate in night watch duties. In return, they receive pen space for their cattle. Space constraints in communal *kandang* limit the number of cattle a household can keep at any one time. Access to government support for inputs such as fertiliser is often tied to group membership.

A household in Lombok with access to land will typically sow one crop of rice in the wet season, followed by a dry season crop, such as maize, soybean or tobacco. In addition, maize, cassava, chilli or forages are grown on bunds between rice fields. Grass for cattle is collected from riverbanks, roadsides and unused land. Unless explicitly claimed by a farmer (through signs or symbols), forages and grass are considered common property resources and thus can be grazed or collected by anyone. This fact greatly inhibits adoption of forage plantations, as even claims on forages often lead to conflicts among farmers.

Most households engage in some degree of off-farm activities for cash income (e.g., brick making, transportation). While this provides additional income security to the household, it also means less time available for on-farm activities. Income from off-farm activities is most often used for paying daily expenses, such as commodities, taxes and additional food.

Cattle provide the farming household with an opportunity to pay for major items by selling animals whenever needed. This practice allows for cash liquidity when required. When questioned about the income function of cattle farming, respondents in Lombok distinguished between:

- calf production: provides annual income for large expenses;
- fattening of bulls: provides 6-monthly regular income;
- poultry and goats: provides income for daily expenses.

At certain times in the year cattle prices tend to rise, e.g., during religious celebrations when demand is greater. Where possible, farmers try to plan the sale of their cattle according to the fluctuating market price. This is because households generally do not find it difficult to sell cattle. Most prefer to sell to traders who frequently visit villages. For farmers, this removes risk and costs required to transport animals to the market.

Respondents perceive the lack of available mating bulls as the key resource constraint to cattle production (*cf.* van Wensveen *et al.*, 2011). Prior to the project intervention, farmers either left cows in communal areas in hope of serendipitous mating, moved cows to neighbouring villages for mating, or used commercial artificial insemination services. Even where households kept bulls for fattening, they were not perceived as suitable for mating, since it was believed that this would make the bull lose weight and result in loss of income. Thus, farmers responded well to the project's provision of bull mating services. It was by far the single most widely adopted practice out of the package of cattle management techniques offered by the project (*cf.* Table 1). Perceived requirement and options offered seemed to coincide well in this case (less so in others).

Households estimate rearing cattle to be one of their most labour-intensive activities, due to time investments in the cut and carry of forage, relocation of cattle to grazing sites and watering spots during the day and returning them to the pen each night. The tasks of looking after cattle are shared between men, women and children within the same household. When feed resources are scarce, men generally travel longer distances to search for forage. Most households see these activities to be a major burden on their time budgets and react cautiously to any new investments into cattle management if these are perceived to put further strain on time resources.

Other than keeping mating bulls, households were reluctant to adopt practices relating to forage production and feed management. As productive land is limited, forage production would require redistribution of land to grow feed instead of food crops. Reduction of paddy land under land-scarce conditions is not considered a viable option among farming households in Lombok. Smaller forage plantations along bunds and in home gardens can be an alternative, but amounts are usually not sufficient to feed the herd. Thus, households are required to devote significant amounts of labour to "cut and carry" (i.e. retrieving forage from areas distant to the homestead). Significantly, however, small forage plantations are seen as a safety net for times when farmers are unable to travel in search of fodder, (e.g., due to illness, or during peak labour times).

Other than the limited availability of mating bulls most households did not perceive major problems with their cattle management systems. They were eager to use the group's bull for mating; thereby saving cash re-

sources from being invested into expensive and often unreliable artificial insemination services. Satisfaction with other aspects of their cattle production, such as feed availability, meant little incentive to try new varieties of forage introduced by the project, even where there would have been nutrition benefits for cattle and production benefits for the household.

Respondents mentioned that, to be a successful farmer, a Sasak from Central Lombok must have both cattle and rice [8]. This is typified by the Sasak language expression *'ngaro ngarit'* which conveys the sentiment that cattle and cropping are complementary and together provide for a good income. Decisions on where to allocate resources into the future depend on perceptions of security. Investment in land is seen as providing concrete and tangible results as food and marketable crops. Cattle, on the other hand, cannot provide for a predictable income due to price fluctuations and risk of animal theft. Rather, households tend to breed or fatten cattle to provide for additional income with little (physical or financial) investment [9].

3.1.2 Networks

The project staff deliberately focused their efforts on *kandang* groups for information provision and support. Key members within each group, often the *kandang* leader or the bull keeper, were used to demonstrate the results and impacts of adopting different practices.

Use of the mating service, was readily accepted within the group as well as non-member households [10]. This provided a pathway for information to reach households outside the *kandang* groups and beyond usual familial or neighbourly connections. When non-*kandang* group members obtained mating services they were provided with information regarding other cattle management practices by group members who have been trained in these activities. However, actual uptake of these practices by non-*kandang* group members has been limited.

While non-member households were provided with information when they take their cows for mating, weak ties to the *kandang* group (i.e., relationship between members and non-members based on the provision of a service only) result in limited follow-up support and lack of consistency in the information provided. In Figure 2(a) and 2(b) the majority of non-group members interviewed had only adopted one practice – controlled mating through the group's bull service. These farmers felt unable to properly implement any of the other practices suggested.

In cases where non-group members have been able to successfully adopt practices in addition to the bull service, they are part of the social network of *kandang* group members (through family, neighbour or friendship ties). Of the six non-member farmers in Figure 2(b) who have adopted more than one practice, all have close relationships to group members, either by family, friendships or as previous members of this group.

In Figure 2(c) more than half of non-members who used the bull mating service adopted more than one practice. These respondents refer to family and neighbourly relations or, more generally, to repeated discussions with group members and being able to observe the development of forage plots and quality calves.

3.2 CASE STUDY 2: Baru, Bone and Gowa Regencies, South Sulawesi

3.2.1 Resources

In comparison to Lombok, Sulawesi has a lower population density (between 135–311 people per square kilometre across three study Regencies; see Table 2). More land availability allows for diverse land use distributed between paddy, other crops and grazing areas.

Due to the absence of *kandang* groups, the project worked with individual farmers in South Sulawesi. While the project staff would work with any farmer willing to learn about the introduced practices, five farmers in each village (n=60) volunteered as 'champions' to promote new forages and practices among their fellow community members It was anticipated that direct relationships with champion farmers would support demonstration of benefits, and farmer-to-farmer communication of practices.

In the South Sulawesi production systems, feed availability was a key constraint to cattle production, particularly during the dry season. While a shortage of bulls for mating was also seen as a constraint to cattle production in Sulawesi, establishing a mating service akin to that in Lombok was not a viable option for the lack of functional farmer groups and communal pens. Lack of infrastructure and resources (existing pens or time, money, materials to build one) were also a barrier to the separation of cows and calves for early weaning. Hence, the primary focus for the introduction of practices was on forage and feed management. The introduction of new forage varieties by the project was deemed viable due to land availability and the potential for land use substitution. This proved to be a successful project intervention.

[8] The Sasak are the majority ethnic group on the island of Lombok (`http://www.ethnologue.com/language/sas`).

[9] High labour costs do not seem to factor in these decisions.

[10] The *kandang* group subsequently began to commercialise the mating service to non-members within the community.

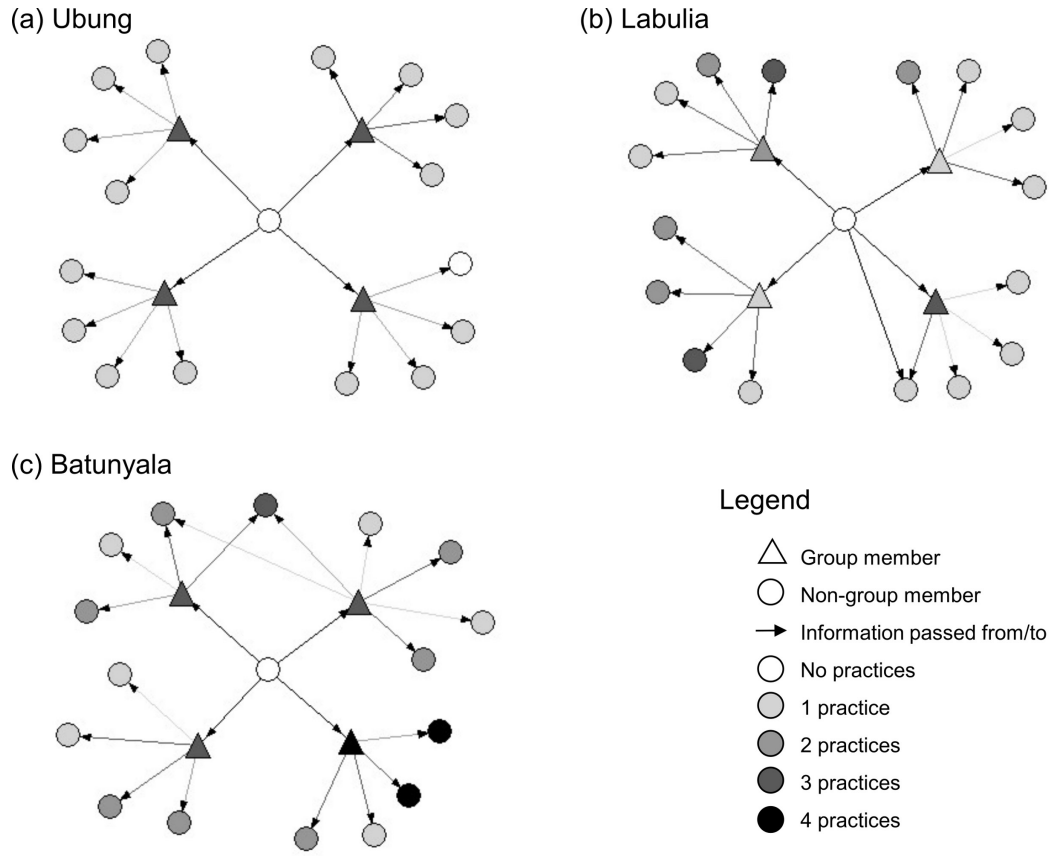

Fig. 2: *Information provision and adoption in a kandang farmer group, Lombok. Centre nodes represent project field staff; the nodes closest to the centre are members the group; nodes further out are non-group members (grey shading based on number of practices).*

Households typically produce a minimum of one rice crop, plus a secondary crop using residual soil moisture (maize or peanut). Most farmers leave their cattle to graze on harvested cropland, spare land, or dedicated grazing land. Forage production, largely elephant grass, was in common usage prior to the project, but used only to supplement grazing in the dry season. Farmers maintain that this practice is well established and adapted to the farming system as cattle provide for additional income without large investment requirements of cash or labour.

Some households engage in off-farm activities (e.g., brick making, transportation) to supplement farm income, and this is particularly pronounced in areas close to urban centres (i.e., Gowa Regency). The trade-off between labour spent on- and off-farm further restricts the ability to adopt new practices.

In Sulawesi, cattle are not typically part of the regular income stream of the household. Rather, cattle are a form of wealth saving and tend to be sold for particular events or purposes. Income from cattle production is used for three main purposes:

- major investments (agricultural inputs, vehicle, agricultural machinery);
- exceptional expenses (health costs, ceremonies, festivities);
- emergency expenses (in case of crop failure).

Most households rely on free grazing and homesteads rarely include cattle pens. Due to the distances between homes and grazing locations collection of forage is a task mainly carried out by men. Forage varieties introduced by the project proved popular as they were planted on spare land closer to the household, which reduced travel time to collect grass. [11] In addition, these varieties have higher nutritional value than traditional grasses harvested on roadsides and river banks (Pengelly *et al.*, 2003; Lisson *et al.*, 2010). Where households adopted new forage varieties, a redistribution of labour within the household became possible. Men spent less

[11] See Table 1 for a list of introduced and existing varieties.

travel time to collect forage and were able to reinvest spare time into cropping, rest, or other activities. Due to shorter distances and lighter carrying loads, however, it also led women to take on more responsibility to feed cattle, thereby adding to their time burden of cutting and carrying forage to sheds. On balance, the adoption of forage banks was seen to significantly decrease time spent in cattle feeding, albeit proportionally less so for women. These labour savings were stated by interviewees and had been quantified in previous studies of the same areas by Lisson *et al.* (2010).

While many farmers in South Sulawesi aspire to increasing cattle production as a proportion of their farming system, meeting household food requirements through rice production remains a priority. For many farmers cattle are a good complement to rice production, but are unlikely to replace rice as the central pillar of their livelihood strategy. Interviews suggest households only consider allocating land for the purpose of growing forage if they (1) have sufficient land for household rice production; and (2) already own enough paddy land to hand down to their children. Households with sufficient land area to fulfil these needs, or who had limited labour to manage additional paddy land would turn to cattle production. To the farmers interviewed, cattle are of secondary importance to acquiring sufficient land.

3.2.2 Networks

Households with ties to champion farmers received an increased amount of information, resources and support. Thus, champion farmers were central to the spread of information, through relationships based around the mosque, neighbours and family ties. [12]

Champion farmers in Sulawesi were usually located close to main roads and their highly visible forage banks sparked interest both within and outside their existing networks. In addition, formal promotional activities were arranged by the project, such as farmer field days to demonstrate practices as well as cattle weighing events at the mosque. While these events help to spread basic knowledge, only those households living in the same village as the champion farmers tended to successfully implement a number of practices. Figure 3 illustrates the importance of proximity for adoption in a village in Bone Regency, South Sulawesi. The node with the highest number of connections in the diagram represents a champion farmer who hosted a field day on his farm. While many farmers visited from outside the

[12] Staff employed as extension officers by the project were clearly essential to the spread of information. However, since they were artificial to the existing networks, we decided not to focus on their role here.

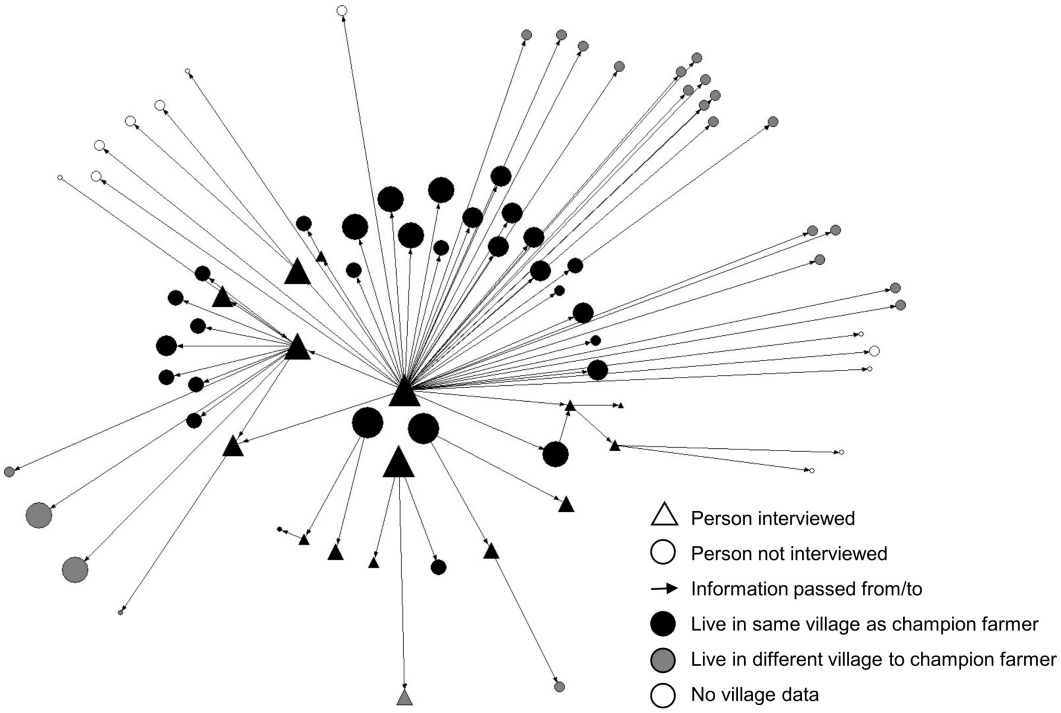

Fig. 3: *Adoption of practices by proximity to champion farmer in Bone, South Sulawesi (central node represents champion farmer, size of node represents number of practices adopted).*

village, these farmers adopted only one, if any, practices. In contrast, farmers residing in the same village as the champion farmer adopted more than one practice as they experienced higher exposure and access to information to support decisions on innovations.

Champion farmers in South Sulawesi were key to providing proof that the new practices (in particular, new forage varieties) yield positive results within the farm context. Their activities reassure potential adopters and provide feedback to those hesitant to take risks (see also Millar & Connell, 2009). Unsurprisingly, family and neighbours are often the first to receive information from the champion farmers, reflecting existing networks. Family receives higher preference in the distribution of resources concomitant to information, such as seeds or seedlings to start forage banks.

4 Discussion

Resource requirements for adoption of new cattle management techniques include, at a minimum:

(1) land for forage banks;
(2) pens to separate cows and calves;
(3) a bull for mating; and
(4) time to manage forages and implement the other practices.

If resources are tied up in other uses (e.g., land for other crops, or labour for other activities) then the household needs to make a decision whether substitution is worthwhile. This decision will depend on whether a problem with current production systems is perceived, and whether increasing cattle production is desirable. Culturally specific *common sense* determines this perception, not what is feasible from a rationalist perspective.

South Sulawesi and Central Lombok offer two distinctly different sets of resource conditions in which the household decisions are framed. In Central Lombok, with high population density, limited land, and high levels of landlessness, land is a key consideration. This impacts on inputs (e.g., land for forage production) as well as outputs (e.g., increased herd size) of cattle production. At the same time, limited land also encourages a diverse management strategy that places importance on cattle, as often the area of land owned by households is not sufficient to ensure subsistence.

In South Sulawesi, land is more abundant and substitutions between land uses do not necessarily threaten household food security. As a result, lower importance was placed on cattle rearing as compared to rice and dry-season crops. Instead, lack of bulls for mating and limited labour availability inhibited higher investments into cattle management.

Yet in both cases, even households with sufficient resources often decided not to change farming practices despite strong evidence for increased cattle production. Geertz' *common sense* understanding of household strategies for wellbeing and perceptions of risk provides a rationale for such decisions. While there is a complementary relationship between rice and cattle production, East Indonesian households tend to favour household food security through rice production. Many of these households selectively adopted new practices rather than the full package. They preferred investing into activities that added value to cattle production, while minimising risk in rice production. Many households saved time through the adoption of forage banks. The saved time, however, was not re-invested into cattle production, but into rice or other livelihood activities (*cf.* Lisson & Corfield, 2010).

Champion farmers and *kandang* group members freely shared information about new practices. However, multiple links in social networks (community, economic, family, proximate location) and/or redundant provision of information supported adoption. Farming households seem to rely on these redundant links to develop trust in new techniques and build evidence for their usefulness. Mating services and farmer field days provided an opportunity to introduce new practices, but do not necessarily lead to uptake if they do not resonate with shared cultural values.

Farming households tended to rely on a variety of sources and influences when considering new cattle management practices. Champion farmers in South Sulawesi and *kandang* group heads were mentioned as the most influential sources for decision-making. However, informal sources, such as conversations at Friday mosque meetings, with neighbours or consultation with family members can be vital when deciding for changes in farm management.

The research presented here presents complex household decisions under constrained resource conditions typical for modern-day smallholder societies. While the argument that resource constraints limit the capacity to invest in changes to the farming system is not new (*cf.* Ellis, 2000; McGregor, 2008), our data points toward the interpretation that adoption decisions by farming households occur within a rationality context, which is culturally specific. Just as green revolution farmers in the 1960s might have chosen to introduce new varieties for status reasons or modern-day French farm-

ers adopt integrated crop protection and organic farming techniques for social and moral reasons (Mzoughi, 2011), current Indonesian smallholders make selective decisions based on (a) long-term resource availability, (b) form and source of communication, (c) risk and (d) livelihood strategies.

5 Conclusion

Subsistence-oriented smallholders are willing to experiment with changes to their farming systems where they do not conflict with existing livelihood strategies. It is easier for households in South Sulawesi to experiment with forage production, where land is relatively more abundant, than in Lombok, where land is scarce and prioritised for crop production. New practices are selectively applied and adapted as perceived through cultural rationality. While one could assume that increased cattle production would mark a gradual transition of the farming system it is more likely that subsidiary role of cattle to rice persists.

The continued focus on crop production and the low preference for expanding cattle has implications for Indonesia's policy on beef production, specifically, the Government's policy to establish Nusa Tenggara Barat as the 'Land of One Million Cattle' (*cf.* Jakarta Post, 2009). As long as smallholders conduct farming at a subsistence level and land is scarce they are reluctant to invest heavily in growth of herd size, increased calf turnover or fattening. Smallholders may see cattle as a supplementary income or even as a stepping-stone out of farming. Hence, the feasibility of current policy goals needs to be revisited.

While demonstration of the benefits and savings of new practices is important to inform a larger number of households about new practices, it is equally important to rely on existing networks for continued communication of ideas. This is paramount to providing legitimacy to the information and re-interpretation of the information along indigenous cultural categories. Decontextualised information is less valuable and useful than information, which can be accommodated by or integrated into *common sense* knowledge systems.

As research and development projects continue to provide innovations for smallholders to reduce poverty and transition into sources of global supply chains, "best practice" demonstrations seemingly provide rationalistic solutions for transforming farming systems through technology and practice change. Understanding the cultural context of household decisions requires a departure from economic decision-making models in both the design of and expectations for agricultural intervention. At stake is the potential for development agencies and practitioners to achieve improved rates and – more importantly – socially adapted adoption of innovations to traditional farming systems.

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