Livelihood impacts of the cattle management practices in mixed crop-livestock farming systems in South Sulawesi, Indonesia

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Abstract. The research project to increase cattle production was conducted in South Sulawesi, Indonesia as a part of ACIAR funded projects in South Sulawesi (SMAR-2006-061). The project worked in 3 regencies: Bone, Barru and Gowa with four villages in each regency. Bali cattle (Bos javanicus) are a vital component of Indonesia’s crop-livestock farming systems. Improving Bali cattle productivity on these smallholdings is essential not only to the Indonesian Government’s beef self sufficiency targets, but also to improving the economic development of farmers living in these regions. However, smallholder farms in the region are usually sized less than two hectares in total; and comprise a mix of crop, forage, livestock and human activities. The aim of this research was to investigate the impact of the introduction of cattle management practices on household livelihoods. The result showed that these types of projects may contribute to improved livelihoods in the long-term, but unlikely to be visible in short term.

1. Introduction

The introduction of cattle nutrition and breeding management practices in South Sulawesi, Indonesia has been documented to improve cattle production [1]. The benefits and rationale in increasing cattle production are closely linked to reducing poverty and improving household livelihoods for smallholder farmers [2,3]. Initial investigations into the project’s impacts have indicated labour savings and increased income from cattle [4]. However, the broader impact on household livelihoods has been under analysed. This research detailed on the outcomes of a brief study into livelihood impacts of ACIAR funded projects in South Sulawesi (SMAR-2006-061).

The term livelihood here refers to the portfolio of activities that a household undertakes to secure food and income (cash and non-cash) to meet basic needs, as well as to secure reserves to offset risks and cope with shocks. Rural livelihoods are often diverse and integrated. That is, several different activities and strategies are pursued in order to meet needs and spread risk.

The households involved in this research were engaged in mixed crop-livestock farm systems. However, agricultural production is often only a part of the range of options in which rural households engage to earn a living. In this context, cattle are part of livelihood strategies alongside agricultural activities (rice and other crops) as well as non-agricultural activities (wage labour, small business etc.).
In such conditions, it is likely that adjustments to one part of the system – such as increasing cattle production – are likely to have impacts on other parts. Previous research in Eastern Indonesia has emphasised the importance of rice farming as a source of subsistence, security and cultural identity (Grünbühel and Williams, forthcoming). While increasing productivity of cattle in isolation of other livelihood activities has beneficial impacts [1] it is unclear how this impacts on the broader livelihood portfolio.

The aim of this research was to investigate how the introduction of cattle management practices impacted household livelihoods. Analysis takes into account the multi-faceted nature of rural livelihoods. That is, considering that livestock production makes up just one activity within a household’s portfolio of livelihoods the aim was to examine how changing norms and practices for rearing cattle have impact on other livelihood activities and the broader household livelihood strategy.

**Brief overview of the project SMAR-2006-061**

The research project to increase cattle production was conducted in South Sulawesi between 2007 and 2010. The project aimed to increase cattle production through the introduction of simple practices to improve nutrition and breeding, tailored to suit local circumstances. The project engaged with smallholder households, promoting five practices to improve feeding and management of Bali cattle:

- Making better use of existing forages
- Introducing new forages
- Seasonal (controlled) mating to match feed supply and labor needs
- Early weaning and preferential feeding
- Feed budgeting and planning to meet forecast feed demands

The project was applied in 3 regencies (Bone, Barru and Gowa) and four villages in each regency. In each village, the project team worked closely with five ‘best bet’ farmers, who were the first in their community to adopt any of the practices. These best bet farmers were then asked to pass on the information to at least five other farmers, known as ‘scale out farmers’. Scale out farmers also received information and support from the project team. In this project, the focus was on forages as a first step, as this was often the easiest for farmers to introduce to their farming system. Best bet farmers increased cattle ownership; carrying capacity (based on area of forage); and had improved live-weight gains as a result of adoption [1].

**2. Materials and methods**

Livelihoods are dynamic, with households responding to a range of market, cultural and other drivers. Challenges involved with measuring livelihood impacts include: difficulties in gathering comparable data over distinct points in time (how do we know livelihoods have changed?); as well as determining causality (how do we discern the causes of change?).

Qualitative data was collected through focus group discussions with a sample of farmers who had different experiences in the project. The team wanted to avoid direct questioning linking the project and changes to livelihoods to avoid pre-empting results. A variation of the ‘ten seeds technique’ (TST) [5] was used as a focus for discussion. The technique asks groups to distribute a finite number of counters (locally available seeds or stones etc.) in response to a question. Conventionally, the technique was used to define community development issues [5]. In our case focus groups were asked to distribute 20 seeds according to different livelihood activities, e.g. how much labor they allocated to different activities (rice production, cattle, non-farm activities etc.). This question was repeated for different points in time to highlight changes before and after the project (5 years ago, now, 5 years into the future). The total number of seeds remains constant, therefore allocation across activities and over time can point to trade-offs between activities and allows for more discussions on why and how the situation has changed.

In our case, three sets of questions were asked to explore how livelihoods had changed: seeds were allocated based on changes to labor (time spent on different activities); income (proportion of cash income from different activities); and importance (the priorities households gave different activities).
These three areas were chosen partly because they reflect the anticipated areas of impact, but also because they reflect key cross-cutting aspects of household livelihoods.

![Figure 1: Example of “Ten Seeds Technique”](image)

Labor is a key resource input required to undertake any activity; it is also finite. Where changes to the farming system require additional labor, it must be either taken from another activity, or purchased (ie. externally hired labor). Income on the other hand, is a key output and whether in cash or in food or other resources, is key to improving livelihoods. Lastly, we sought to explore the importance of different livelihood activities in acknowledgement that this may not reflect income gained or labor invested alone, but rather is likely to be a more complex consideration of security, cultural values, aspirations, risk and so on.

Distribution of the 20 seeds across categories on the table is one aspect of the data collection. However more important is the narrative and reasoning as to why the seeds are allocated in the manner in which they are. Facilitators discussed the distribution of seeds over time and across categories with participants.

On Ground Team members (OGTs) were trained in facilitation and the ten-seed-technique by members of the specialist team. OGTs facilitated the workshops and debrief discussions, where held with members of the project specialist team and other OGTs. The debrief sessions provided a chance for OGTs and Project Specialist Team members (PSTs) to discuss results and initial analysis. The tables and notes from discussion have become the main data sources. These discussions also allowed a comparison of the *emic* or household perspective, with the observations of the PSTs as a scientific community, also referred to as *etic*. By comparing etic observations with emic beliefs, deeper analysis is possible.

Six workshops were held in three villages in South Sulawesi in May 2011. Of the two workshops in each village, one was held with best bet farmers, and one with scale out farmers. The project team felt holding separate workshops for best bets and scale outs would encourage free and open discussion. It was thought scale out farmers would otherwise simply agree with the opinions of the best bet farmers, who were often influential, high standing individuals in the community. Participation in the workshops was voluntary, and numbers ranged from 5 – 12 people. In both areas, OGTs were responsible for inviting participants and were asked to invite a range of households (ie. mix of men and women, landed and landless etc.).

3. Results and discussion

3.1. Barru regency: Tompo village
Tompo is near the road, and close to the main village of the regency. All workshop participants were male land owners. Each typically achieved two harvests of rice – the first for self-consumption and the second for sale. Farmers also had secondary crops, primarily for home consumption and cattle. They also keep chickens which are left to run free and so have few inputs. Poultry is predominately for
home consumption. Livelihood strategies can therefore be considered as agriculturally based; with strong market integration after subsistence needs have been met.

### Table 1. Changes to livelihoods, Barru workshop results

|                | Best bet farmers | Scale out farmers |
|----------------|------------------|-------------------|
| Labour         | 5 years ago      | Now               | In 5 years time |
| Secondary crop |                  |                   |                |
| Non-farm work  |                  |                   |                |
| Rice           |                  |                   |                |
| Plantation     |                  |                   |                |
| Cattle         |                  |                   |                |
| Other livestock|                  |                   |                |
| Forage         |                  |                   |                |
| Income         | 5 years ago      | Now               | In 5 years time |
| Secondary crop |                  |                   |                |
| Non-farm work  |                  |                   |                |
| Rice           |                  |                   |                |
| Plantation     |                  |                   |                |
| Cattle         |                  |                   |                |
| Other livestock|                  |                   |                |
| Forage         |                  |                   |                |
| Importance     | 5 years ago      | Now               | In 5 years time |
| Secondary crop |                  |                   |                |
| Non-farm work  |                  |                   |                |
| Rice           |                  |                   |                |
| Plantation     |                  |                   |                |
| Cattle         |                  |                   |                |
| Other livestock|                  |                   |                |
| Forage         |                  |                   |                |

The results for the two groups are very similar. The responses suggest a gradual shift from rice to cattle as the most important activity, but with both remaining important. The shift from rice to cattle is particularly evident in the allocation of labor. For both the best bet and scale out farmers, rice had by far the most significant labor investment five years ago. Since then, mechanization and outsourcing of labor has decreased the direct labor inputs of the household. Paid labor is generally from outside the regency. The price for rice is considered good and stable due to government regulation, however the cost of labor is increasing, resulting in a decrease in profit overall. Best bet farmers anticipated this would mean rice becomes less important over time, and some had decided to rent land to other farmers instead of cultivating themselves.

The number of cattle in the village has been increasing over the last five years. There are multiple factors contributing to this. Government programs to increase cattle ownership and the popularity of ‘gaduh’ or profit-sharing arrangements have led to an increase of animals. According to the workshop participants, the village has a reputation for having good security so cattle are unlikely to be stolen; and ample forage resources to ensure good condition. Cattle owners without the land or time to look after the cattle themselves enter into sharing arrangements with farmers in Tompo village. The increase in animals has been supported by good prices for cattle and re-allocation of labor saved in rice production to cattle.
Increasing income from cattle is partly related to farmers increasing their overall herd size and selling more cattle, but also due to the increasing price of cattle. Farmers expect the price will continue to increase and hope to continue increasing the size of their herds. The increasing cattle numbers has also meant increased need for forages. This is highlighted with gradual increases in labor for forage cultivation and collection over time and gradual increase in importance. In the past, the farmers had planted elephant grass, however now they have learned about different types of grasses and have increased their plantings. The increased labor is not seen as detracting from other activities.

The head of the village (Kepala desa) was present during the debrief and voiced his strong support for the project’s role in improving forage availability and knowledge about management and use. At the regency level, there is a regulation to keep animals away from roads and instead keep them tethered at home. The regulation came about due to safety and security concerns and to avoid conflicts between cattle owners and farmers whose plant resources they graze. The regulation has not been implemented across the regency, but Tompo village has converted it into a local regulation. The improved forages make it possible for farmers to follow the regulation since they are able to ensure adequate feed supply without needing to graze the cattle.

3.2. Bone regency: laburasseng village

Bone regency tends to have the largest parcels of land ownership per household of the three regions studied in Sulawesi. Laburasseng village has reasonable road access but is a long way from the main village. Fields are terraced due to the steep topography. Similar to Barru, farmers grow rice and secondary crops depending on the weather. At the time of the workshop, the rains had been unusually high, so a third rice crop had been planted instead of secondary crops. The Scale Out farmers that participated have better access to irrigation than the Best Bet farmers.

In the best bet workshop, there has been a slight increase in the importance of cattle, which is expected to continue. While rice and cattle used to be of equal importance, in five years’ time, cattle and forage were seen to be the most important activities. Farmers said the trend was to move resources from rice to cattle, because rice is at more risk of disease and destruction from rats. At the time of the workshops, there was a significant problem with rats in the village. Households were meeting each morning to go out together and dig out / kill the rats. In addition to destroying the rice crops, the rats were also eating the cocoa. Cattle are seen as less risky and less input for the profit gained than rice.

In contrast, the scale out farmers had rice increasing in importance slightly before declining over the next five years. In part, this reflects the good rains and subsequent three harvests of rice that were achieved at the time of the workshops, but also reflects different perceptions of risk. Scale out farmers feel rice, secondary crops and cattle are stable investments over time and did not mention the risks that concerned the best bets. They see little change in the future but would like to become more focused in their livelihood activities, rather than more diverse.

In terms of labor, there was a sharp increase in cattle related labor in the best bet workshop, from four seeds five years ago, to ten seeds in the present. Farmers say the number of animals has increased because the price is good, so more labor is required to look after them. At the same time, many households have switched from free grazing, to tethering their animals, which increases the demand for cut and carry grasses. The labor for forage collection has decreased due to the recent planting of forages in backyards and closer to their homes. The scale out farmers have experienced a similar decrease in labor for cut and carry, however as cattle numbers increase, they anticipate associated increases in labor for forage, and are considering expansion of forage production by converting spare land and unproductive plantation areas.

There were only a few farmers in the workshops who engaged in non-farm work. Income from wage-labor is low compared to cattle and so those who can do so prefer to devote labor to cattle and other agricultural pursuits. Both best bet and scale out farmers have cocoa plantations, which were planted more than 5 years ago. However, none of the plantations are producing fruit due to unsuitable soil and weather conditions. Many still have the plantations regardless of their essential failure to produce fruit, largely as a source of shade for the cattle.
Table 2. Changes to livelihoods, Bone workshop results

| Best bet farmers | Scale out farmers |
|------------------|-------------------|
| Labour 5 years ago | Labour 5 years ago | Secondary crop 5 years ago | Secondary crop 5 years ago |
| Now | In 5 years time | 5 | 2 | 4 |
| Secondary crop | 4 | 2 | 2 | 2 |
| Non-farm work | 2 | 2 | 2 | 2 |
| Rice | 5 | 4 | 5 | 5 |
| Plantation | - | - | - | - |
| Cattle | 4 | 10 | 10 | 7 |
| Other livestock | - | - | - | - |
| Forage | 5 | 2 | 1 | 5 |
| Income 5 years ago | Income 5 years ago | Secondary crop 5 years ago | Secondary crop 5 years ago |
| Now | In 5 years time | 4 | 3 | 5 |
| Secondary crop | 5 | 3 | 5 | 5 |
| Non-farm work | 2 | 4 | 2 | 2 |
| Rice | 6 | 6 | 5 | 5 |
| Plantation | - | - | - | - |
| Cattle | 6 | 7 | 8 | 8 |
| Other livestock | - | - | - | - |
| Forage | - | - | - | - |
| Importance 5 years ago | Importance 5 years ago | Secondary crop 5 years ago | Secondary crop 5 years ago |
| Now | In 5 years time | 3 | - | 3 |
| Secondary crop | 3 | 3 | 2 | 2 |
| Non-farm work | 2 | 2 | 2 | 2 |
| Rice | 5 | 5 | 4 | 4 |
| Plantation | - | - | - | - |
| Cattle | 4 | 5 | 6 | 6 |
| Other livestock | - | - | - | - |
| Forage | 6 | 5 | 6 | 6 |

3.3. Gowa regency: bontomanai village

Bontomanai is an upland village with large areas of forest compared to the villages in Barru and Bone. Land is limited and the village is far from the main road. Access to irrigation is uneven and those with access prioritizes its use for paddy production.

Workshop results for the best bet farmers suggest diverse livelihood portfolios with participation across all activities. While rice and cattle were the most important, best bet farmers said they pursued a broader portfolio because they had the land and labor available to do so. In comparison, the scale out farmers are currently quite focused on rice, cattle and to a smaller extent, non-farm work. Their activities had been more diverse in the past and some farmers are planning to diversify again in the future. Changes to the best bet farmer livelihoods are subtle, owing to the distribution of seeds across all categories. However, the main changes can be seen in plantations, cattle and forages.

Income from plantation has declined by four seeds while income from cattle has increased four seeds in the same time. Importance of plantations as a livelihood activity has also declined, while labor is expected to increase in the future. The main plantations are cashew and cocoa. While income from cashew plantations was good five years ago, the price has fallen due to disease and competition from other growers. The farmers have trouble with disease and low productivity due to poorly suited soil
and climate conditions. They plan to keep the trees rather than clear the land, but will not do much with the plantations unless they receive further government assistance.

Cattle have filled much of the income gap left by the plantations, and have also increased in importance over this timeframe, now considered equally as important as rice. Increased emphasis on cattle has been encouraged by the increasing, and stable market prices. Labor required for forage has decreased. Similar to the other groups this is due to planting forages in backyards making it easier and less time consuming to collect. They said they had never considered their backyard as a place for forages before, just for trees. They also now realize forage is important to support their cattle. As the forage banks become more established, they expect the labor requirement to keep declining. One farmer was considering growing forage for sale in the future.

Table 3. Changes to livelihoods, Gowa workshop results

| Best bet farmers  | Scale out farmers |
|-------------------|-------------------|
| **Labour**        | **Labour**        |
| 5 years ago       | Now               | In 5 years time |
| Secondary crop    | 2                  | 2               | 3               |
| Non-farm work     | 3                  | 2               | 2               |
| Rice              | 2                  | 4               | 3               |
| Plantation        | 3                  | 2               | 5               |
| Cattle            | 4                  | 4               | 4               |
| Other livestock   | 1                  | 1               | 1               |
| Forage            | 6                  | 4               | 2               |
| **Income**        | **Income**        |
| 5 years ago       | Now               | In 5 years time |
| Secondary crop    | 3                  | 2               | 3               |
| Non-farm work     | 3                  | 2               | 1               |
| Rice              | 6                  | 5               | 5               |
| Plantation        | 6                  | 2               | 2               |
| Cattle            | 3                  | 7               | 6               |
| Other livestock   | 1                  | 2               | 2               |
| Forage            | 1                  | 1               | 1               |
| **Importance**    | **Importance**    |
| 5 years ago       | Now               | In 5 years time |
| Secondary crop    | 4                  | 2               | 2               |
| Non-farm work     | 2                  | 2               | 1               |
| Rice              | 6                  | 6               | 6               |
| Plantation        | 4                  | 1               | 2               |
| Cattle            | 3                  | 6               | 6               |
| Other livestock   | 1                  | 1               | 1               |
| Forage            | 1                  | 2               | 2               |

Changes to the scale out farmer workshop are starker than the best bets. To look first at labor, five years ago labor was allocated across all activities except for other livestock (poultry). Currently however it is allocated only to cattle and rice. In the future however scale out farmers plan to allocate labor to secondary crops and plantations again. Scale out farmers currently receive most of their income from cattle and rice, with the proportion of income from cattle increasing slightly over the last five years. In five years, however, they anticipate an even split between secondary crops, rice and
cattle, which would represent large increases in income for secondary crops, and decreases in rice and cattle.

Changes relating to secondary crops are partly due to an expectation that the future will bring partnerships or investment by companies to support maize, which they are able to grow well. It is also due to the balance between rice and secondary crops. This year weather conditions have been favorable for rice, so most farmers have opted for additional rice crops rather than secondary crops.

With regard to the plantations, after initial investments, they are waiting for their coffee and cocoa plantations to mature. Plantation has relatively high labor to income because, like the best bets, they face problems with disease and fluctuating market prices.

Cattle are anticipated to become more important than rice in the future. Against rice and cattle, all other activities are subsidiary. The scale out farmers have increased the number of cattle they own—encouraged by the good market price but also because they know more ‘technology’ to raise them. The increase in cattle has meant they don’t need to do non-farm work and can allocate the labor to cattle instead. In the future they expect their income from cattle will decrease due to family obligations (ie. for social occasions like marriage) or due to reducing the size of the heard as they get older.

The scale out farmers explained their strategy this way: they consider rice and cattle are the two essential platforms of their livelihood strategy—rice for daily survival and cattle for saving and big investments. The best bet farmers spread across more activities as they have the land and labor to do so. Whereas the scale out farmers have come to focus more on rice and cattle because they feel they are the most promising activities.

**What changes and which cause?**

It is clear from the workshops that there are varied perceptions that guide changes to livelihoods. In South Sulawesi, some workshops traditional integrated systems of rice, cattle and secondary crops as stable and secure strategies, while others saw rice as risky and costly and preferred to shift resources into cattle. These evaluations and perceptions are complex and shape household decision making as well as how changes in the farming system are perceived. So, to return to our original question: *How has the introduction of forage and cattle management practices impacted on household livelihoods?*

The impact of the project practices can be seen in the context of several trends or drivers perceived by the participants. These include: access to land; increasing cattle numbers; and changing labor dynamics. We will discuss each of these in turn.

First, access to land is a key driver in terms of changing livelihoods for farmers. Access to land is not directly related to the impact of project practices on household livelihoods. However, where land is limited, it suggests that households may be more interested in livelihood activities that require less land; ie. the project may have more pronounced impacts in areas where land is limited and alternatives to rice production sought. Participants perceived land shortages and difficulties to access land for agriculture will become more pronounced into the future. Groups with low levels of land ownership and therefore limited ability to secure livelihoods through rice production have more incentive to move away from ‘traditional,’ rice-based livelihoods, which are less likely to lead to security over the longer term. The livelihood portfolio of these households features more non-farm work and cattle as alternative strategies to rice production.

Second, participants in Sulawesi noted an increase in the number of cattle being kept in their area. There are a number of reasons for this. On one hand participants noted the Indonesian government, through DINAS has supported a number of programs to increase cattle ownership. However, farmers also noted that stable and increasing market prices for cattle, low inputs and improved knowledge all contributed to cattle being an attractive option for farmers, that is, more people see it as a good livelihood activity. In Sulawesi, some mentioned they now have the knowledge to keep cattle more effectively than before.

In Sulawesi, the increased number of cattle (being kept individually and generally in the village) also required more forages. In this case, farmers had spare land to trial new forages, but farmers in Bone and Barru also spoke of converting unproductive plantation land to further increase their stocks. Results from the workshop show clear reductions in time spent in forage-related activities. The land
available in Sulawesi for forage banks meant the need for distant travel for cut and carry was removed, however labor was required to establish and maintain plantings of forages that were previously left unmanaged. For farmers in Barru at least, increasing their time devoted to forages is seen as a choice rather than a necessity.

Anticipated changes in other activities like secondary crops and rice production relied on speculation relating to government policy or commercial enterprise with private companies, as well as infrastructure (irrigation) and climate.

4. Conclusion
From the study we can conclude that:

- Slow process of change.
- Small step towards increased importance in cattle.
- Landless more receptive?
- Changes to labor / forage collection.
- While these types of projects may contribute to improved livelihoods in the long-term, unlikely to be visible in short term.
- In the scheme of all the drivers and pressures that households respond to when making livelihood decisions, limited impact is possible.

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