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Participatory Learning to Diversify Fodder Crop Production in Small Dairy Farms surrounding the Natural Forest Area of Konto Watershed, Malang, Indonesia

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Introduction

Increasing demand for livestock products in Indonesia has encouraged farmers to intensify their farming systems by multiplying their stocking rates. The largest increase of livestock and milk production has occurred in East Java, followed by West Java and Central Java, respectively (Morelink Asia Pacific, 2011). Although the livestock sector is currently intensifying, it has not been accompanied by improved management of fodder production. Farmers still depend on natural resources for fodder, which sometimes leads to overgrazing. Furthermore, the availability of forage from nature usually fluctuates from season to season. Thus, farmers also utilize by-products and wasted crops to feed their livestock. However, these are not only less nutritious, but sometimes also poisonous (Byrne, 2007). To face the constraints of forage availability at intensive dairy farms, growing fodder crops is very important. Nevertheless, this can also become a dilemma because farmer land ownership is very limited. On the one hand, it is urgent to support dairy farms' development by growing fodder, but on the other—if the forage growing areas are expanded into the productive land for food—it will reduce food production by subsistence farmers. In order to reduce land use competition between feed and food growing purposes, high-yielding and nutritious fodders that are also tolerant to marginal land conditions need to be identified and developed along with the application of the bio-diversification concept, to stabilize yield levels.

Materials and Methods

The study was carried out in Sumber Agung village, Ngantang, Malang, at 7° 52' 50" 14 S, 112° 23' 13" 54 E. The total area of Sumber Agung is 756,688 ha, comprising 40% forest, 36% agro-forestry (coffee and fruit trees), and 15% rice fields and arable crops, with the remainder of the area made up of houses, cemeteries, and other purposes. The village is bordered by two mountains, its topography is hilly, and the mean elevation is 800 m above sea level. Kalikonto is the most important river, and it is used as the main source for irrigation and other livelihood activities (Village Profile of Sumber Agung, 2012). The majority of the inhabitants work in the agricultural sector, in either dairy or crop production. Next to the feed from natural areas, elephant grass is the dominant forage for dairy cows. The project introduced options for improving fodder quality, including diversification of cropping systems with legumes and growing fodder crops in underutilized spaces. A regional farmer field school (FFS) was organized as a participatory learning method. Twenty dairy farmers with 2–20 dairy cows participated in the FFS to learn the effects of legumes on milk quality and milk quantity, and to compare the performance of three legumes. These were *Lablab purpureus* (L), *Psophocarpus tetragonolobus L.*, and *Crotalaria juncea,* under five cropping systems: (1) monoculture, (2) intercropped with elephant grass, (3) intercropped under fruit trees, (4) intercropped with coffee, and (5) intercropped with pine trees.

Results and Discussion

The results of the experiment showed that *C. juncea* was more robust than the two other legumes due to (1) its fast growing habit, (2) its ability to regrow after cutting cuts, and (3) its adaptability to be intercropped with other plants. The harvested biomass of *C. juncea* during the study period is shown in Table 1.

Table 1. *Crotalaria juncea* biomass in different cropping systems (Mg ha^{-1}).

Treatments	1st cut	2nd cut
Monoculture	3.6	3.2
Intercropped under agro-forestry	0.9	0.5
Intercropped with coffee	1.2	0.9
Intercropped with elephant grass	0.5	0.1
Intercropped with pine trees	1.1	0.8

Milk production was increased after one month by adding *C. juncea* to dairy cow rations. The highest increase (5–9%) was found with cows in the three-month lactation stage when they were fed with *C. juncea*. Balancing the feed composition by including also the legume *C. juncea* increased the quality of milk in terms of protein content. The highest increase (20–21%) was again found with cows in the three-month lactation stage.

Based on the interviews, 100% of respondents reckoned that it was easy to grow the three legumes. However, *C. juncea* had the highest score in terms of ease of growing, while *P. tetragonolobus* and *L. purpureus* were more difficult to manage. The respondents' opinions did not differ greatly between *L. purpureus* and *C. juncea*. However, overall, *C. juncea* was considered more preferable.

Conclusions

The better quantity and quality of milk due to the inclusion of legumes in the cows' diets increased farmers' profits, leading to better incomes for their livelihoods. Participatory learning is an effective approach to transfer and share knowledge between farmers and stakeholders. It is also a good way for stakeholders to establish networks and for communities to communicate. The participants experienced positive impacts, including better performance of their dairy cows due to more balanced feed rations.

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References

Byrne, D. 2007. Dangers in feeding waste material to livestock. Prime Fact 311. New South Wales Department of Primary Industry. Australia. at: www.dpi.nsw.gov.au/primefacts

Indonesian Statistics. 2012. Village Profile of Sumber Agung, Sub-District of Ngantang in Malang District.

Morelink Asia Pacific. 2011. Indonesia Dairy Industry Development. Report to International Final Corporation. Australia. 59p. Available at http://www.ifc.org/wps/wcm/connect/93f48d00470e3bf883ffd7b2572104ea/Dairy+Industry+Development-2011.pdf?MOD=AJPERES

Pete Smith, P., Gregory, P.J., van Vuuren, D., Obersteiner, M., Havlík, P., Rounsevell, M., Woods, J., Stehfest, E. And Bellarby, J. 2010. Competition for Land. *Phil. Trans. R. Soc. B*. 365:1554 2941-2957. Doi.10.1098/rstb.2010.0127