



Importance of livestock in small-scale farming systems of rural coffee areas in Colombia

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In the Colombian Andean area, cattle production systems have been associated with high environmental impact on strategic ecosystems, like tropical forest, e.g., deforestation on the Andean hills of Colombia to establish pastures as the source of cattle food or to establish coffee plantations (Etter and Wyngaarden 2000). The natural regeneration processes of forest were observed specially, where the coffee growing areas were abandoned (Rodríguez 2011). Rationally managed livestock systems could play a positive role in rural livelihoods as they constitute a source of protein food with reduced costs, nutrient recycling, increased savings, availability of draught force, and a diversified source of commercial products (Mora and Holguin 2011). Studies in the Colombian Andean area generally focused on quantitative aspects of production systems. Our concerns were to know in depth the interactions between livestock and crops, in the small farm frame, hence, a qualitative approach was the best way (Denzin and Lincoln 1994). Patton (2002) defined qualitative research as attempting to understand the unique interactions in a particular situations. In short, the aim of qualitative research is to truthfully present findings to others who are interested in what you are doing (Learning Domain 2013). In qualitative research, the sample is small and not chosen randomly. Rather, the choice of a sample is purposeful (Patton 1996). It is because, in a qualitative approach the researcher is not as concerned about generalization of findings. On the contrary, qualitative research is willing to trade-off generalization of findings (which is an important aims of quantitative research) in order to understand and interpret what was going on (Patton 1996). The objective of this study was to understand the role of small scale livestock production systems as a source of additional income in rural farmers. The research included the identification and partial characterization of the small scale livestock production systems belonging to the coffee growers in the Andean area of Colombia, South America.

A sample of 49 farmers was selected. We uses a theoretical sampling, it is a central part of the grounded

theorizing (Glaser and Strauss 1967). Thus, theoretical sampling is tied to the purpose of generating and developing theoretical ideas, rather than being aimed either at producing findings that are representative of a population or at testing hypotheses (Hammersley 2006). The study was carried out in households of coffee growing areas from Icononzo, Villarica, Fresno and Líbano, located in the Andean area of Tolima (Colombia). The main economic activity of this area is growing coffee, however, the livestock activities are gradually finding place in the household's activities portfolio. It is a tropical rainy forest area. Cluster analysis was used as a tool for classifying agents into various types (Hansen and Jaumard 1997). In this article, we used multivariate statistical analysis based on a dissimilarities matrix (such as in numerical values) among the observations. Steps in our analysis were: surveys and interviews were done to identify and analyze the socioeconomic characteristics of families and develop a database. The variables used to create the dissimilarity matrix in the cluster, were of agro-ecological and socioeconomic factors and the production behaviours of the farm households: family composition, farm area, coffee area, banana area, pasture area, homegarden area, total amount coffee bushes, grain coffee production, cattle, pigs, hens and chicken.

A clustering of farms was performed using the technique of cluster analysis (CA) by the Ward method. This procedure allows a typology according to their similar characteristics to the variables analyzed. Ward's method forms groups where variability within groups is high and is the highest among groups. To further establish the differences between groups of farms were performed Canonical discriminant analysis.

Finally, we analyzes the role of domestic animals within the context of livelihoods of rural families distributed in a typology of three cluster defined by multivariate analysis. Clustering using cluster analysis of multivariate statistics, showed 3 groups or types of farms i.e., small, medium and large farms (Fig. 1). In addition, we distinguished 3 types of farms based on the estimated area.

Land use in the farming systems: A farming system is defined as a population of individual farm systems that have

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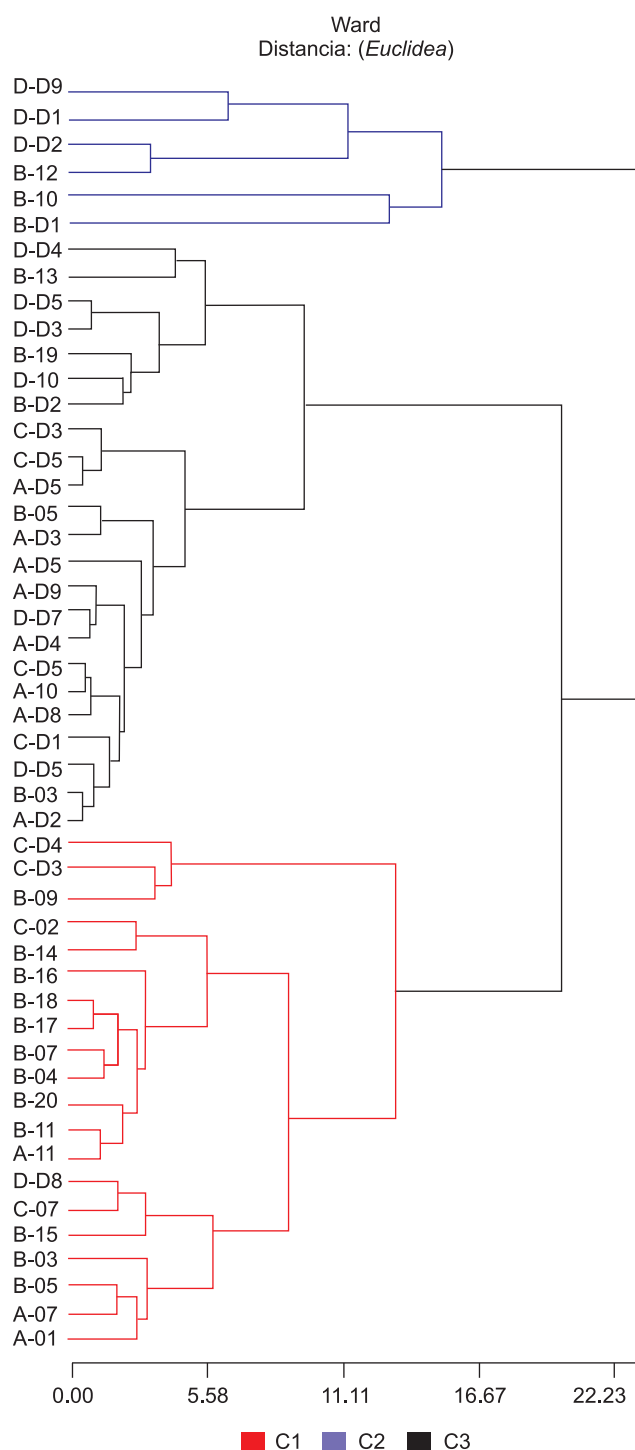


Fig. 1. Dendrogram of cluster analysis of peasant farms in northern and central-eastern Tolima.

broadly similar resource basis, household livelihoods and constraints and for which similar development strategies and interventions would be appropriate (Subba 2012). In a farming system, the farm family is also intimately linked. Farming system is holistic in its scope; therefore it is the focus in this research. The proportion of land uses reported on households from study area is given in Table 1. C1 cluster grouped the larger farms, where the pastures have become the main land use, especially in the last decade, however conservative lands constitutes an important proportion of farms too, probably because in these lands crop areas were abandoned.

On the contrary, the coffee plantations constitute the main land use in the medium-size farms. There is a balance among different land uses of small farms, which could indicate a strategy to diversify the livelihoods. There is a variety of agricultural sub-systems within the small farming system due to the different family's decisions.

Coffee production system is the main component of the small farming systems, that is generally associated with *musa* species (banana and plantain) working as shade. Interacting with the coffee system we found the livestock component, specially, backyard-poultry birds, like chickens and laying hens. These are oriented to own family consumption, particularly it constitutes a ceremonial found as reported previously (Meillasoux 1973). Other families manage cattle production systems at small scale, especially dual purpose, to obtain milk for selling and own family consumption. They sell the male calves and fatted cattle too.

Human capital: Households are constituted by 3 or 5 persons on an average. The average peasant household members in Colombia is 5, smaller families are made up of 3 people and the most numerous by 15. However, today 78% of households generally are made up of 5 members or less. The majority (85%) of families are two-parent nucleated (Alvarez and Restrepo 2003).

The households were similar in terms of education levels, predominating people with elementary or incomplete secondary studies, although, in both medium and large farms holders 23–28% achieved university studies. It was noted that 4% of the small farms households lacked formal education compared to medium (3.6%) and larger farm (3.2%) households. Most of the people in large and medium farms (53% and 52%, respectively) households were adults with ages up to 40 year-old, suggesting a tendency of increased migration of young people, perhaps looking for better job opportunities in big cities. In larger and small farm holders, the majority (58%) are males. These results

Table 1. Indicators of typology of households from coffee area of Tolima, Colombia

Cluster	Average estimated area (ha)	Average of land use proportion (%)						
		Coffee	Musa	Pastures	Fruits	Timber	Homegarden	Conservation
C1 Large	32.2±20.2	8.58	2.13	45.28	3.80	10.49	1.58	28.15
C2 Medium	20.5±12.9	52.00	2.96	8.35	15.91	1.40	6.66	12.72
C3 Small	8.9±6.6	23.65	0.96	25.8	10.32	7.86	6.03	25.38

Table 2. Productive parameters in different type of farms from the coffee area of Tolima, Colombia

Descriptor	C 1	C 2	C 3
Farms (#)	20	6	23
Total area (ha)	32.2±20.2	20.5±12.9	8.9±6.6
Pastures area (ha)	16.4±13.5	3.8±2.6	3.2±2.1
Cows (UA)	17.6±8.6	4.8±4.8	4±2.5
Pigs (#)	3.0±2.6	9.0±11.3	2±1.7
Backyard chicken (#)	14.4±20	12.5±12.7	5.5±6.5

confirmed previous findings (Mora-Delgado 2011) that households were similar in terms of education levels, predominating people with elementary or incomplete secondary studies and a minor proportion of households that had attained university studies and finally a lack of formal education mainly in small farms.

Table 2 confirms the importance of cattle breeding activities in the C1 cluster and the minor species as a livestock component oriented to own family consumption. The small number of animals in each farm apparently did not represent a commercial activity.

Animals have been used for transportation and work force. In addition, animals constitute a source of manure used as fertilizer in gardens. In particular the chicken manure is used to fertilize coffee plantations (Piñeros *et al.* 2011).

In Fig. 2 we can see a differential distribution of herds that depend on farm's productive trends. The cluster C1 showed an important proportion of bulls, calves and steers that are probably in the fattening process, and suggested a tendency towards dual-purpose animal production. Cows constituted 50% of the herd in cluster C3, indicating a distribution oriented to dairy farm production. High proportion of calves and heifers in cluster C2 suggested a tendency towards dairy farm production.

Indeed, the coffee constitutes the main income source, but the livestock activities are increasing and they start to participate in the economical portfolio of the households. The highest incomes per farm were achieved in the medium farms, indicating that those farms are perhaps the more efficient, however, there may be others reason too, for example, the higher incomes, provided by coffee trade, which result in a high income per ha (US\$ 233.7; US\$ 3 184.1; US\$ 601.0; for C1; C2 and C3, respectively). But, it

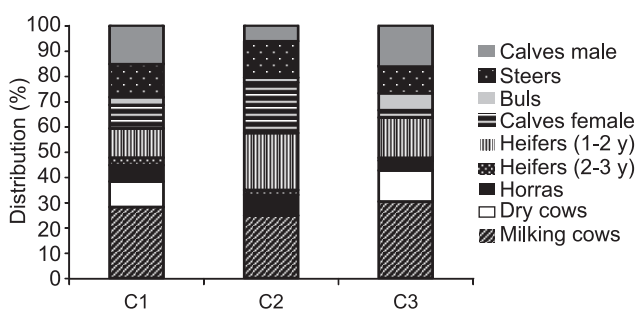


Fig. 2. Herd distribution in each cluster of farms from coffee area of Tolima, Colombia.

is also evident the differences in the proportion of incomes generated by the agricultural and livestock sources.

The coffee production represents the main source of family incomes of C2 (97%), while the livestock production represents a strategy to improve livelihoods. Incomes from livestock activities are important in C1 (52%) and less in C3 (38%). As the most important problems that were recognized in the households interviewed in this study, are those related with the constantly increasing high prices of consumables and supplies, in addition to coffee production's dependency as their main income source. A study in Caldas (another region of Colombia) confirmed these results (Mora-Delgado *et al.* 2011). While the contribution of coffee is high (>50%) in the accounts of peasant household assets of the coffee zone is clear that livestock activities involved in a significant proportion, ranging between 26 and 38%. In this area, coffee farming remains more by cultural tradition than for financial reasons.

Animal subsystems are very important asset as a way to improve social wellbeing of both rural households and communities. In the majority of interviewed households, livestock component was constituted by minor species like chickens, hens and pigs, oriented mainly to own family consumption. It is important to study the environmental impacts of cattle production systems and also, it is necessary identify new eco-friendly strategies to improve the cattle breeding. Finally, livestock systems have contributed to improve livelihoods and wellbeing of peasant in the households of Andean rural area of Colombia.

SUMMARY

Rationally oriented livestock systems play a positive role in rural livelihoods. In this study, surveys and interviews were carried out in 49 coffee growers from Andean region of Colombia, where domestic animals were used as source of protein food, nutrient recycling, a way to increase income and a source of commercial products. The farmers were classified in C3, C2 and C1 clusters, according to socioeconomics and technological indicators extracted from the survey. Different features of farming system were identified in each cluster, among them C1 has the largest farm area (average 32.2±20.2 ha). The clusters C1, C2 and C3 have an average of 17.6±8.6, 8±4.8 and 4±2.5 cows / farm respectively. In addition, coffee growers have other livestock species like chickens, hens and pigs, that are oriented mainly to own consumption. In conclusion, livestock systems, particularly small scale cattle production contribute to the livelihoods and wellbeing of coffee growers in the Andean area of Colombia.

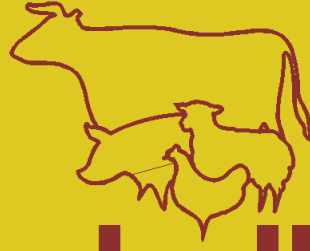
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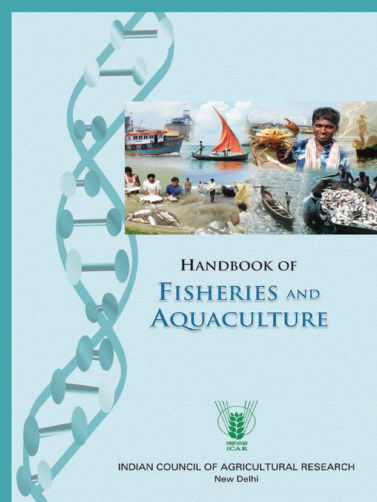
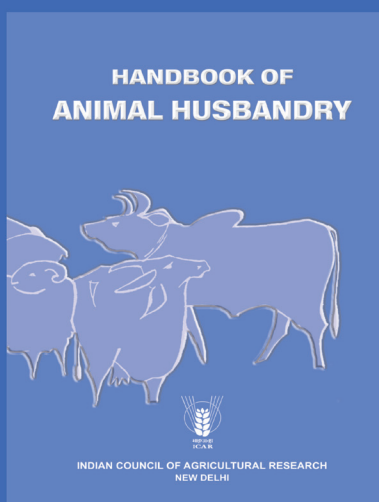
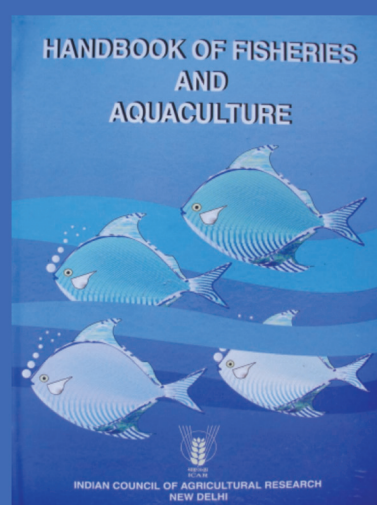
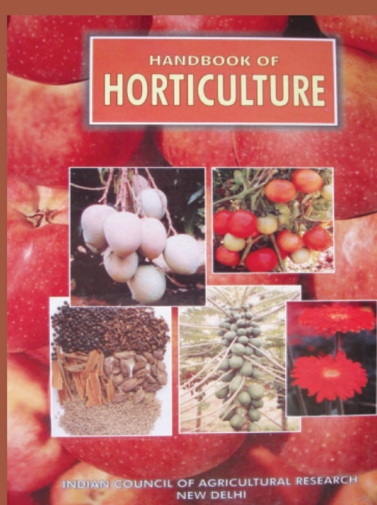
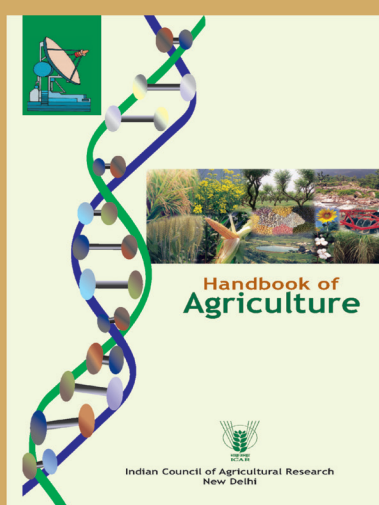
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