

Resource endowment and the greater good: balancing labour between family and individual fields on Beninese farms

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Abstract

In Sub-Saharan Africa, most farms are family farms. In these family farms, the workforce may include a husband, his wife or wives, his children, his brothers, and in-laws if brothers or sons are married. The literature provides evidence that 2 types of fields can coexist within family farms: family fields and individual fields, resulting in complex farm management systems. The objective of this study was to investigate the diversity in management systems and their interaction with the production system, as the first step towards suggestions for improving farmer livelihoods.

A functional farm typology was developed for two case-study villages in Benin; Zonmon in the Southern part and Pelebina in the North-western part. Differences among farm types were related to the amount of resources and to resource-allocation between family fields and individual fields, as well as between major landscape units i.e. uplands and wetlands.

In both villages, individual fields emerged mostly in better-endowed farms. Granting individual fields may be a reward that only better-endowed farms can afford and a strategy to enhance commitment to family fields. The emergence of individual fields may also reflect differences between the objectives of the farm head and the objectives of the family's individuals. Differences in objectives are more likely to appear in better-endowed farms for which opportunities are diverse. Tipping of the balance from family fields to individual fields was more visible in Zonmon, where family fields on better-endowed farms were either small compared to large female-run individual fields or remained large but were served by hired labour.

1. Introduction

In Sub-Saharan Africa, most farms are family farms. In these family farms, the workforce may include a husband, his wife or wives, his children, his brothers, and in-laws if brothers or sons are married. The literature provides evidence that 2 types of fields can coexist within family farms: family fields and individual fields (Guirkinger *et al.*, 2015; Kanzianga and Wahhaj, 2013). In family fields, the whole family works as a team and the farm head decides on crops, management sequences and profit distribution among the family farm members. Individual fields are granted by the farm head to a family member for individual use and profit. The interactions between the farm management system and the production system add complexity, as does the presence of different landscape units. In wetland agricultural systems, family fields and individual fields may be located in uplands or in wetlands or both. They can either be dedicated to food production or to cash production.

In this study we address resource division between men, women, boys and girls as one of the factors defining farm resource use strategies. Understanding the diversity in strategies is expected to help generating and identifying meaningful field and farm level options to improve farmer livelihoods (Tittonell *et al.*, 2005; Cortez-Arriola *et al.*, 2015). Targeting such interventions, however, has thus far not considered resource division among members of family farms.

The objective of this study was to investigate the diversity in management systems and their interaction with production systems, as the first step towards suggestions for improving farmer livelihoods and well-being. We assumed well-being was related to freedom of initiative (the right of using resources to pursue an objective) and to profit distribution among family members. We distinguished family well-being from individual well-being.

2. Material and methods

2.1 Case study villages

We selected two case-study villages in Benin; Zonmon in the Southern part and Pelebina in the North-western part. The choice of the villages was subsequent to a rapid regional assessment from south to north in Benin. It was driven by contrasting agro-ecological and socio-economic conditions.

In Zonmon, the rainfall distribution is bimodal. The average yearly rainfall varies from 1100 to 1200 mm. The village territory includes a lowland with mixt flooding regime and 3 permanent streams. The main ethnic groups are Mahi and transhumant Fula. The major food crop is maize and the major cash crops are groundnut and rice.

In Pelebina, the rainfall distribution is unimodal. The average yearly rainfall reaches 1300 mm. The village territory includes 21 lowlands of which 7 allow for irrigating market gardening during the dry season. The main ethnic groups are Yom and sedentary Fula. The major food crop is *noudosse* yam and the major cash crop is cotton.

2.2 Farm survey

The number of farms in each village was determined by drawing social maps with help from local authorities. A random sample of 51 out of 134 (38%) farms from Zonmon and 50 out of 146 (34%) farms from Pelebina were surveyed.

Semi-structured interviews with farm heads were used to gather information on the family structure and labour availability as well as to identify the management units on farms and locate sets of fields associated to each management unit. In the end, a total of 100 farmers (51 farm heads and 49 individuals) in Zonmon and 143 farmers (50 farm heads and 93 individuals) in Pelebina were interviewed. Each management unit (the farm head management unit or individual management units) were interviewed on three occasions in Zonmon: once during the long rainy season of 2012, once during the short rainy season 2012 and once during the dry season 2013, and on two occasions in Pelebina: once during the rainy season of 2012 and once during the dry season 2012-2013.

The different fields of each farm were mapped using a GPS. Information collected on a field-by-field basis included: land use, production orientation i.e. food production or cash production, cash spent on chemical inputs in the local currency (FCFA), cash spent on hiring workforce in the local currency (FCFA) and major landscape unit i.e. uplands or wetlands. Fields suitable for dry-season rice or dry-season market gardening were classified as belonging to wetlands. These

fields could therefore be located in inland valley bottoms, inland valley fringes or nearby streams (in Zonmon only).

Farm income was not estimated because it requires collecting a large amount of accurate quantitative data. Farm ranking in relation to their resource endowment will refer to some of its drivers (e.g. land and labour assets) and consequences (e.g. cash available to purchase chemical inputs and to hire labour).

2.3 Farm typology

A functional farm typology was developed for each village. Types were identified by combining PCA and Ward's minimum variance clustering. Data were normalised and standardised. We started with 43 candidate variables in Zonmon and 48 candidate variables in Pelebina (Table 1). A first PCA was performed to select a subset of variables based on their quality of representation in a two-dimensional space and simplify the overall analysis. Variables for which the sum of the squared loadings on the two first principal components was larger than 0.5 were included in a second PCA. Patterns revealed by the second PCA could be interpreted in a two-dimensional space. PC1 and PC2 together explained 67% of the original variance in Zonmon and 63% of the original variance in Pelebina. Farm scores on PC1 and PC2 were finally used in the hierarchical cluster analysis. The choice of the number of types was driven by a jump in dissimilarity and our interpretability of types. Supplementary variables were used for detailed characterisation of each farm type. Given the skewness of the data, the non-parametric Kruskal Wallis test was used to test for differences among farm types. When significant differences were found, Dunn tests were performed using Bonferroni as p-value adjustment method and a probability of <0.05.

3. Results

3.1 Functional farm typologies

Differences among farm types were related to the amount of resources and to resource-allocation between family fields and individual fields, as well as between major landscape units i.e. uplands and wetlands.

We identified 3 farm types in Zonmon (Figure 1). Type 1 farms were small households with both a small number of family members working in the farm and a small number of family members supported by the farm. Family members worked together in all fields under the farm head's supervision i.e. there was only one management unit in the farm. Type 3 farms were large households with both a large number of family members working in the farm and a large number of family members supported by the farm. In Type 3 farms, 1 to 3 individual management units were found. Female individuals tended large upland fields and hired external workforce. Women also handled wetland fields but all in all farm activities were focused on uplands. In Type 3 farms, female individuals contributed substantially to food production as well as to cash production. Type 2 farms were similar in size to Type 3 farms. The farm head managed large rice fields in wetlands with high levels of chemical inputs and external labour inputs. Food production was mostly ensured by the farm head. In these farms, 1 to 2 individual management units were encountered, managed by females. Located in uplands and/or in wetlands, the fields were mainly used for cash crops.

Table 1: Candidate variables to be included in the PCA

Zonnon (43 variables)	Pelebina (48 variables)
Age of the farm head; number of family workers; number of dependants	Age of the farm head; number of family workers; number of dependants
Number of management units	Number of management units
Area owned in uplands (ha); area owned in wetlands (ha); livestock (TLU)	Area owned in uplands (ha); area owned in wetlands (ha); livestock (TLU)
Area borrowed in uplands (ha); area borrowed in wetlands (ha)	Area borrowed in uplands (ha); area borrowed in wetlands (ha)
Family fields in uplands (ha); individual fields in uplands (ha); family fields in wetlands (ha); individual fields in wetlands (ha)	Family fields in uplands (ha); individual fields in uplands (ha); family fields in wetlands (ha); individual fields in wetlands (ha)
Food crops in family fields in uplands (ha); food crops in individual fields in uplands (ha); food crops in family fields in wetlands (ha); food crops in individual fields in wetlands (ha); cash crops in family fields in uplands (ha); cash crops in individual fields in uplands (ha); cash crops in family fields in wetlands (ha); cash crops in individual fields in wetlands (ha)	Food crops in family fields in uplands (ha); food crops in individual fields in uplands (ha); food crops in family fields in wetlands (ha); food crops in individual fields in wetlands (ha); cash crops in family fields in uplands (ha); cash crops in individual fields in uplands (ha); cash crops in family fields in wetlands (ha); cash crops in individual fields in wetlands (ha)
Maize (ha); rainy-season rice (ha); dry-season rice (ha); cassava (ha); sweet potato (ha); groundnut (ha); cowpea (ha); bambara nut (ha); geocarpa groundnut (ha); soya (ha); dry-season market gardening (ha); rainy-season market gardening (ha); oil palm trees (ha); fallow (ha)	<i>Noudosse</i> yam sown in 2012 (ha); <i>noudosse</i> yam sown in 2013 (ha); <i>assina</i> yam sown in 2012 (ha); <i>assina</i> yam sown in 2013 (ha); cassava transplanted in 2011 (ha); cassava transplanted in 2012 (ha); maize (ha); sorghum (ha); millet (ha); rice (ha); groundnut (ha); cowpea (ha); bambara nut (ha); soya (ha); cotton (ha); dry-season market gardening (ha); rainy-season market gardening (ha); groves (ha); fallow (ha)
Chemical inputs in family fields in uplands (FCFA); chemical inputs in individual fields in uplands (FCFA); chemical inputs in family fields in wetlands (FCFA); chemical inputs in individual fields in wetlands (FCFA)	Chemical inputs in family fields in uplands (FCFA); chemical inputs in individual fields in uplands (FCFA); chemical inputs in family fields in wetlands (FCFA); chemical inputs in individual fields in wetlands (FCFA)
Hired workforce in family fields in uplands (FCFA); hired workforce in individual fields in uplands (FCFA); hired workforce in family fields in wetlands (FCFA); hired workforce in individual fields in wetlands (FCFA)	Hired workforce in family fields in uplands (FCFA); hired workforce in individual fields in uplands (FCFA); hired workforce in family fields in wetlands (FCFA); hired workforce in individual fields in wetlands (FCFA)

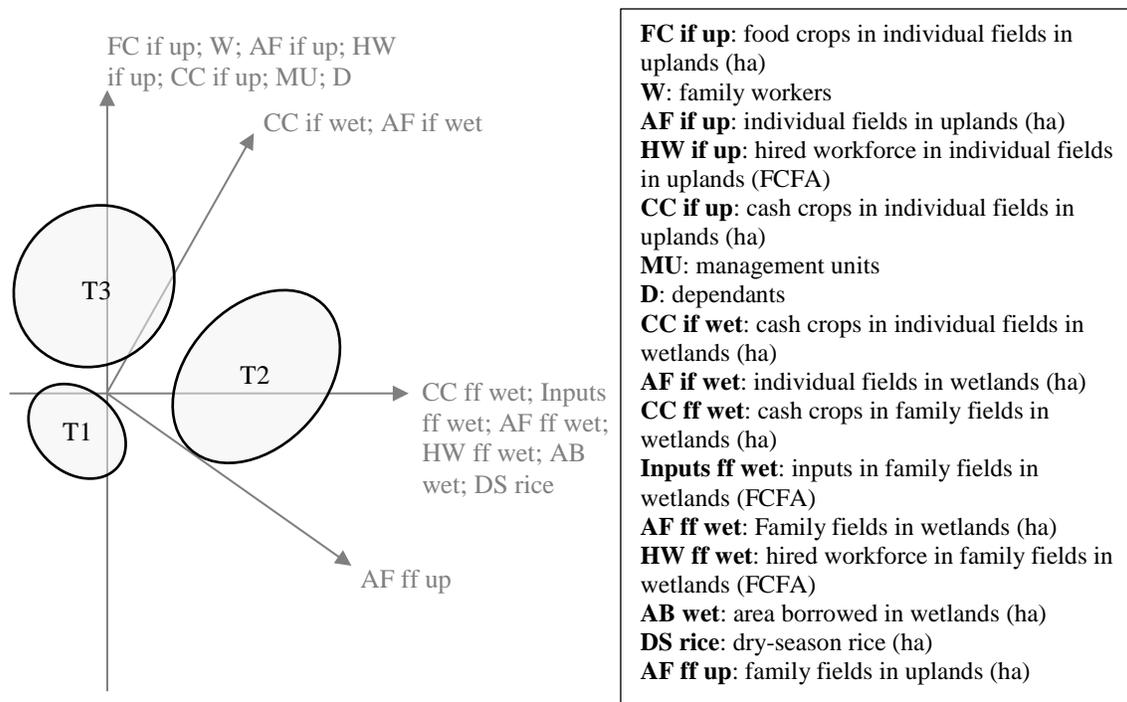


Figure 1: Schematic representation of the functional farm typology in Zonmon. Gradients for variables are symbolized by arrows. Farm types are symbolized by ellipses.

We identified 5 farm types in Pelebina (Figure 2). Type 2 farms were small households with both a small number of family members working in the farm and a small number of family members supported by the farm. Family members worked together in all fields under the farm head's supervision i.e. there was only one management unit in the farm. Type 4 farms were medium size households. Food production in upland family fields included large *assina* yam fields compared to other farms. The number of management units and the area farmed in individual fields were intermediate compared to other farms. Individuals who were granted fields mainly grew cash crops in uplands. Type 1 farms were medium size households. The number of family members supported by the farm was similar to Type 4 farms. The number of family members working in the farm, however, was larger than in Type 4 farms. The number of management units and the area farmed in individual fields were larger than in Type 4 farms. Individuals who were granted fields mainly grew cash crops in uplands. Type 3 farms were medium size households. The number of family members supported by the farm was similar to Type 4 farms and Type 1 farms. The number of family members working in the farm was similar to Type 1 farms. In Type 3 farms, the number of management units was similar to Type 4 farms. The area farmed in individual fields was, however, larger than in Type 4 farms and similar to Type 1 farms. Individuals who were granted fields mainly grew cash crops. Cash crops grown by individuals included cotton in uplands and off-season market gardening in wetlands. Chemical inputs were used moderately and allocated to both upland family fields and upland individual fields. Type 5 farms were large households. . The number of family members supported by the farm was larger than in other farms. The number of family members working in the farm was large and similar to Type 1 and Type 3 farms. The area under cash crops in upland family fields was larger than in all other farms. Indeed, in Type 5 farms, most farm heads managed large cotton fields. In Type 5 farms, the number of management units was large and similar to Type 1 farms. Individuals who were

granted fields mainly grew cash crops in uplands. Chemical inputs were used in larger amounts than in other farms and allocated to upland family fields.

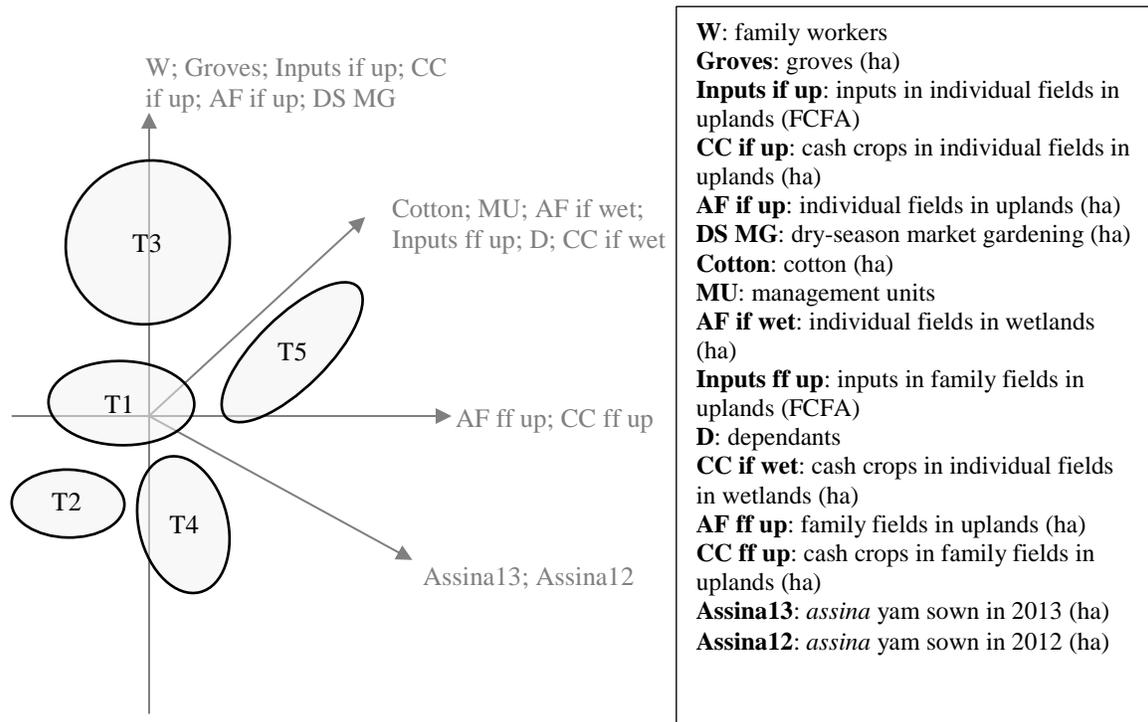


Figure 2: Schematic representation of the functional farm typology in Pelebina. Gradients for variables are symbolized by arrows. Farm types are symbolized by ellipses.

3.2 Differences in resource endowment between farm types

In Zonmon, Type 1 farms represented the worse-endowed farms (Table 2). Type 1 farms owned less land in both uplands and wetlands and mobilized less family labour. Their expenditure on hired workforce was small. Type 3 farms represented moderately-endowed farms in Zonmon (Table 2). Type 3 farms were as well-endowed as the best-endowed Type 2 farms in terms of family labour and land in uplands but had less land in wetlands and less cash available for hiring workforce. Type 2 represented the best-endowed farms in Zonmon (Table 2).

Table 2: Differences in resource endowment among farm types for Zonmon. Different letters indicate differences among farm types at the 5% level. Resource endowment increases from Type 1 to Type 2.

	Resource endowment		
	Type 1	Type 3	Type 2
Area owned in uplands (ha)	a	b	b
Area owned in wetlands (ha)	a	ab	b
Number of family workers	a	b	b
Hired workforce (FCFA)	a	ab	b

In Pelebina, Type 2 represented the worse-endowed farms (Table 3). Type 2 farms owned the least area of land in uplands and had least family labour. Type 4 farms were better endowed than Type 2 farms but less endowed than Type 1, Type 3 and Type 5 farms (Table 3). In terms of land in uplands, Type 4 farms were better endowed than Type 2 farms, as well-endowed as Type 1 and Type 3 farms but less endowed than Type 5 farms. The number of family workers was intermediate between Type 2 and Type 1, Type 3 and Type 5 farms. Type 1 and Type 3 farms represented moderately-endowed farms in Pelebina (Table 3). Type 1 and Type 3 farms were similarly endowed in terms of land in uplands and family labour. Type 5 farms represented the best-endowed farms in Pelebina (Table 3). They owned more land in uplands compared to other farms. Type 5 farms were as well-endowed as Type 1 and Type 3 farms in terms of family labour.

Table 3: Differences in resource endowment among farm types for Pelebina. Different letters indicate differences among farm types at the 5% level. Resource endowment increases from Type 2 to Type 5.

	Resource endowment				
	Type 2	Type 4	Type 1	Type 3	Type 5
Area owned in uplands (ha)	a	ab	ab	ab	b
Number of family workers	a	ab	b	b	b
Chemical inputs (FCFA)	a	ab	abc	bc	c

3.3 Gender-based division of labour in individual fields

The composition of the management system on farms differed between the case-study villages. In Zonmon, the majority of individual fields were granted to female individuals (Table 4). The area farmed in female individual fields accounted for 98.8% of the area farmed in individual fields. The number of female individual management units was small in Type 1 farms, intermediate in Type 2 farms and large in Type 3 farms. The area farmed in female individual fields was small in Type 1 farms and large in Type 2 and Type 3 farms. In Pelebina, individual fields were granted to both female and male individuals (Table 5). The area farmed in female individual fields accounted for 54.3% of the area farmed in individual fields. The area granted to female individuals did not vary among farm types (0.22 ha on average with a standard deviation of 0.34; 0.03 being the median). The number of male individual management units as well as the area granted to male individuals was small in Type 2 farms, intermediate in Type 4 farms and large in Type 1, Type 3 and Type 5 farms.

Table 4: Differences in gender-based division of labour in individual fields among farm types for Zonmon. Different letters indicate differences among farm types at the 5% level.

	Type 1		Type 3		Type 2	
Household distribution (#)	31		12		7	
Household distribution (%)	62		24		14	
Female individual management units	0	a	2	b	1	ab
Male individual management units	0		0		0	
Female individual fields (ha)	0.00	a	1.04	b	0.70	b
Male individual fields (ha)	0.00		0.00		0.00	

Table 5: Differences in gender-based division of labour in individual fields among farm types for Pelebina. Different letters indicate differences among farm types at the 5% level.

	Type2		Type4		Type1		Type3		Type5	
Household distribution (#)	17		6		14		4		6	
Household distribution (%)	34		12		28		8		12	
Female individual management units	0		1		1		1		1	
Male individual management units	0	a	0	ab	2	b	2	b	1	b
Female individual fields (ha)	0.00		0.12		0.07		0.62		0.02	
Male individual fields (ha)	0.00	a	0.00	ab	0.15	b	0.17	b	0.17	b

4. Discussion

4.1 Resource endowment and labour division

Individual fields emerged mostly in better-endowed farms (Table 6 and Table 7). In the worse-endowed farms i.e. in Type 1 farms for Zonmon and Type 5 farms for Pelebina, family members worked together in family fields i.e. there was only a family management unit in the farm. In the wealthier farms i.e. Type 2 and Type 3 farms for Zonmon and Type 4, Type 1, Type 3 and Type 5 farms for Pelebina, at least 1 individual management unit emerged which added to the family management unit.

Table 6: Differences in labour division between family fields and individual fields among farm types for Zonmon. Different letters indicate differences among farm types at the 5% level.

	Resource endowment -----> +		
	Type 1	Type 3	Type 2
Number of management units	a	b	ab
Individual fields (ha)	a	b	b
Ratio of the area farmed in individual fields to the total area farmed	a	b	ab

Table 7: Differences in labour division between family fields and individual fields among farm types for Pelebina. Different letters indicate differences among farm types at the 5% level.

	Resource endowment -----> +				
	Type 2	Type 4	Type 1	Type 3	Type 5
Number of management units	a	ab	b	ab	b
Individual fields (ha)	a	ab	b	b	ab
Ratio of the area farmed in individual fields to the total area farmed	a	ab	b	b	ab

Individual fields emerged mostly in farms better-endowed in family labour. High correlations (data not shown) suggested that the size of the workforce was a key determinant in the emergence of individual fields within farms. Our finding is supported by Guirkinger and Platteau (2014) who argued that contrary to individual production on individual fields, collective production on family fields is plagued by free-riding, which increases with the size of the workforce. Individual fields allow workers to be rewarded in proportion to their labour (in terms of working hours and efficiency) contrary to family fields on which it would be socially and operationally not likely (Guirkinger *et al.*, 2015). Guirkinger and Platteau (2015, 2014) and Guirkinger *et al.* (2015) indicated that the awarding of individual fields within family farms is a strategy to avoid potential conflicts among family members and therefore to enhance commitment to family fields.

For our samples of farms, 40% of the total area owned was left under fallow in Zonmon and 53% of the total area owned was left under fallow in Pelebina: land availability was not a constraint in our case-study villages. In a context of abundant land, labour may constrain agricultural production (Leonardo *et al.*, 2015). Since individual fields imply labour division between family fields and individual fields, it is likely a reward that only farms better-endowed in family labour can afford.

Another explanation for the emergence of individual fields in the better-endowed farms is that it reflects differences between the objectives of the farm head and the objectives of the family's individuals (Guirkinger *et al.*, 2015). Such differences in objectives are more likely to appear in better-endowed farms for which opportunities are diverse (Foster and Rosenzweig, 2002).

The coexistence of family fields and individual fields reflects the interdependence of the workers. Else, the farm would split into new smaller farms (Guirkinger and Platteau, 2015). Family fields have advantages and may allow: economies of scale and savings associated with the financing of farm public goods (Foster and Rosenzweig, 2002); risk dilution (Chayanov, 1991); or completing farming operations in a timely manner. In farms where family fields and individual fields coexist, the farm head still benefits from the labour of family members on family fields. In return, the farm head has to satisfy part of the needs of these family members. Provided farms are endowed enough, combining family fields and individual fields may be a strategy for the farm head to secure livelihood well-being, in terms of fair remuneration for work and freedom of initiative, for all farm members. In worse-endowed farms, granting individual fields may be to the advantage of an individual but to the detriment of the family as a whole.

Tipping of the balance from family fields to individual fields was more visible in Zonmon, where family fields on better-endowed farms were either small compared to large female-run individual fields (for Type 3 farms) or remained large but were served by hired labour (for Type 2 farms). Different patterns of family fields and individual fields were the result of a farm level rationale. Our research suggest that not only cooperation and conflict (Caretta and Börjeson, 2015; Doss, 2013; Himmelweit *et al.*, 2013) but also resource endowment and in particular, labour endowment at the farm level shape the sharing of resources and profit within farms. In a context of abundant land, the implementation of labour-saving technologies may be to the advantage of agricultural production in family fields (by at least increasing labour productivity) as well as in individual fields (by freeing up working time in family fields). It may positively influence the individual access to resources in the worse-endowed farms and overall contribute to improving farmer livelihoods.

We did not investigate the inputs of individual family workers on family fields and individual fields, land and labour productivity on family fields and individual fields or profit distribution among members of family farms in relation to the involvement on family fields. Further research is needed to map practices and their success in terms of fair economic well-being for family workers.

4.2 Identifying the diversity in resource division patterns between family fields and individual fields: a framework for the gender-oriented literature?

Resource division among family workers was mostly analysed through the lens of gender-based division of resources in the literature. Research focused in particular on how gender-based differences in access to resources affected differences in land productivity between male and female. Here, we investigate the link between observed patterns in resource division among family workers and gender-based differences in access to resources within farms. We question the choice of the unit of analysis in the gender-oriented literature.

Some studies compare male-headed farms and female-headed farms (Peterman *et al.*, 2011; Vargas Hill and Vigneri, 2014; Croppenstedt *et al.*, 2013; Alene *et al.*, 2008; Gilbert *et al.*, 2002; Tiruneh *et al.*, 2001). These studies aggregate data from fields managed by the farm head (male or female family fields) and fields managed by individuals (male and/or female individual fields) in case the latter exist (Table 8). Other studies compare male fields and female fields (Oseni *et al.*, 2015; Slavchevska, 2015; Aguilar *et al.*, 2015; Kilic *et al.*, 2015; Vargas Hill and Vigneri, 2014; Kinkingninhoun-Mêdagbé *et al.*, 2010; Goldstein and Udry, 2008; Oladeebo and Fajuyigbe, 2007;

Akresh, 2005; Quisumbing *et al.*, 2001; Udry, 1996; Saito, 1994). Male fields correspond to male family fields or male individual fields (Table 8). Similarly, female fields correspond to female family fields or female individual fields (Table 8). The combination of type of farm and type of field (the matrix in Table 8), however, is overlooked in all studies we found. Hence information on the role of family fields and individual fields in the family's livelihood is missing.

Table 8: Combination of type of farm and type of field

	Male-headed farms		Female headed farms	
Male field	Male family field	Male individual field	Male individual field	
Female field	Female individual field		Female family field	Female individual field

Enabling women's access to resources is often recommended in the gender-oriented literature (Oseni *et al.*, 2015; Slavchevska, 2015; Aguilar *et al.*, 2015; Karamba and Winters, 2015; Doss *et al.*, 2015; Kilic *et al.*, 2015; Vargas Hill and Vigneri, 2014; Croppenstedt *et al.*, 2013; Kinkingninhoun-Médagbé *et al.*, 2010; Goldstein and Udry, 2008; Alene *et al.*, 2008; Gilbert *et al.*, 2002; Quisumbing *et al.*, 2001; Udry, 1996; Saito, 1994), at least as a lever to decrease the gender-based differences in land productivity (Oseni *et al.*, 2015; Slavchevska, 2015; Aguilar *et al.*, 2015; Kilic *et al.*, 2015).

In our sample, female-headed farms were present in Zonmon only. They all corresponded to widows and belonged to Type 1 farms i.e. the worse-endowed farms. Individual fields did not exist within these farms. Female-headed farms accounted for 23% of Type 1 farms and 14% of the whole sample. In sub-Saharan Africa, 74% of family farms are male-headed farms (FAO, 2011). Typology studies have revealed links between farm resource endowment and farm land productivity (Falconnier *et al.*, 2015; Senthilkumar *et al.*, 2012). We question the relevance of targeting female-headed farms to decrease the gender resource endowment-based differences in land productivity. Instead, we recommend addressing the worse-endowed farms (which includes female-headed farms) to decrease farm resource endowment-based differences in land productivity.

Our results indicated differences in access to resources (family labour, agro-chemical inputs and hired labour) among family workers were the result of a farm level rationale. This farm level rationale appears to succeed in at least maintaining cohesion among family workers. In Zonmon, individuals, including women, had a larger access to resources in better-endowed farms (Table 4). In Type 3 farms in Zonmon, women had even access to more land than the farm head probably due to a lack of cash to hire labour on family fields and to the polygamous status of the farm which may increase the probability of conflicts to occur among family members (Guirkingner and Platteau, 2014). Not granting individual fields in the worse-endowed farms may be for the greater good of family members, whether they are men, women, boys or girls. In Pelebina, female and male individuals had an equivalent access to land. Male individuals in better-endowed farms had a larger access to resources compared to worse-endowed farms but no difference was found with female individuals (Table 5).

Finally, reasoning in terms of male and female land productivity, whether at a field or at a farm level, does not inform on individual economic well-being as profit, in particular from family fields, can be distributed among members of the same family farm. Guirkinger and Platteau (2015) show that as land scarcity increases, the effect of the free-riding problem on family fields outweighs the effect of the size of the workforce available on family fields i.e. a farm split into autonomous branch farms is more profitable than a farm in which family fields and individual fields coexist. In other words, individual fields would tend to disappear as land constraints exceed a certain threshold. We suggest that, at least in a context of abundant land, distinguishing land productivity in male family fields, female family fields, male individual fields and female individual fields may provide better indicators for profit distribution among family members and therefore for analysis of resource allocation efficiency within farms.

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