# 3. Economic Efficiency of Colombian Family Farming and its Potential to Overcome Rural Poverty*

**Jaime Forero Álvarez**

**Claudia Sofía Rodríguez Bernal**

**Álvaro Gutiérrez-Malaxechebarría**

**Amalia Nieto Méndez****

In this chapter we attempt to answer two questions: the first asks if family farming is economically efficient and if so, by how much compared to medium and large-scale agriculture businesses. Our second question is if family farming has the potential to overcome poverty in rural households.

In the first section we discuss the participation of small farmers in the Colombian agricultural sector and conceptually specify what family farming is. In the second we focus on analyzing the efficiency of family farming based on data gathered from a set of ten investigations that we carried out between 1990 and 2013 (Forero, 1999; Forero *et* al., 2000; Forero *et* al., 2002 ; Forero *et* al., 2015; Forero & Corrales *et* al., 2003; Forero *et* al., 2004; Paz, 1999; Amaya, 1998; Cuéllar, 2010; Gutiérrez-Malaxechebarría, 2014), with the last six cited being unpublished. These works show results regarding agricultural income generated within the production systems of family farmers. In the third section, and with additional data (from two other investigations that are also ours), we compare the efficiency of family farming to medium and large-scale business agriculture.



** The authors are, in order: associate professor, Faculty of Rural and Environmental Studies, Universidad Javeriana; Associate professor, Faculty of Agricultural Sciences, Universidad de La Salle; PhD candidate in Environmental and Rural Studies, Universidad Javeriana; Professor, Faculty of Environment and Natural Resources, Universidad Francisco José de Caldas; Ecology student, Faculty of Environmental and Rural Studies, Universidad Javeriana.
The authors are part of the Production and Conservation Systems Group, Faculty of Environmental and Rural Studies, Universidad Javeriana.
The opinions expressed in this chapter are the responsibility of the authors and do not the express opinions of the institutions to which they are affiliated, including both the Banco de la República and its Board of Directors.

Based on this analysis and the fact that the efficiency of family farming can be explained by what we call micro-scale economies, we attempt to clarify the potential of this type of production to overcome rural poverty and discuss possible limitations of household surveys to capture the incomes of rural families from their own production systems, highlighting that, although our data do not reach a national statistical representativeness, we have studied a large number of cases that generate more reliable results than those of these surveys and that can be considered significantly representative of the reality of Colombian family farming.

Of course, any singular investigative process is insufficient in arriving to definitive 'demonstrations', but with the information that has been evaluated, we have a solid base to give some synthesized answers in the fourth section to the questions we ask ourselves.

As we present the quantitative information used for analysis, the methodology in place is explained. Finally, an annex is presented with additional methodological details and quantitative information that expands on that previously presented in the text.

## 1. Colombian Family Farming. Dimensions and Concepts

### 1.1 Dimensions

There is currently a debate among investigators who build agricultural models as to which has greatest potential for economic development: the family model or the business model on a large or medium scale? In other words, it is asked whether family farming, the form of production that predominated in the rural economy for several millennia[1]—from the emergence of agriculture to the 'agro-industrial revolution'— has enough potential to produce surpluses that contribute significantly to the supply of food and raw materials in a contemporary society - in market economies - and generate the necessary income to overcome the poverty of rural households.

In the case of Colombia, the question of generating surpluses in the agri-food supply seems to be resolved according to agricultural statistics that clearly show how small producers have made a substantial contribution to agriculture. Indeed, family farming has shown stable participation in Colombian agriculture: in 1988, the *Misión de Estudios del Sector Agropecuario Rural* (Study Mission of the Rural Agricultural Sector in English) (Bejarano and Berry, 1990) estimated that family farming occupied 57.1% of the planted area and generated 42.7% of the agricultural production value (Bejarano and Berry, 1990); in 2004 this participation was 49% of the production value (Garay *et* al., 2010) and 50% from 2004 to 2008 (Table 1).

[1] Studies by Weber (1923) and Meillasoux (1978), among many others, clearly show that apart from certain slave enclaves, the model of domestic or family production was indeed predominant until at least the process of partial agro-industrialization of the agrarian sector. Weber (1923) particularly refutes the myth of agrarian communism in ancient agrarian societies with strong historical evidence, showing how societies, in which the

territory was collectively appropriated by rural communities, the neuralgic productive resources, such as land and cattle, were especially controlled by family groups.

Recent information based on preliminary data from the 2014 Census from the *Misión Para la Transformación del Campo* (MTC, Mission for the Transformation of the Countryside in English), indicates that the participation of family agriculture is around 40% of the planted area and represents approximately 43% of the production value (MTC, 2015). It should be noted that we refer to agricultural production and not to livestock, for which there are no data to make these claims, however, it is well known that due to the advance of large poultry production, among others, the participation of family production is considerably less. Without accurate information, it can be assumed that the participation of small producers in the livestock sector would be around 25% and, therefore, in the national agricultural sector it would be around 35%.

**Table 1**

**Colombia: Average share of family farming in terms of production value and in area harvested by product, 2004-2008**

**(percentage)**

| Products | Share in the value of agricultural production | | Share of the total area harvested | |
|---|---|---|---|---|
| | Each product in the national total | Each product from family agriculture | Product share in total harvested area | Family participation per havested area |
| Cotton, Fique, & Other Fibers | 3.1% | 43.1% | 1.8% | 47.3% |
| Poppy | 0.3% | 100.0% | 0.0% | 100.0% |
| Rice | 8.9% | 18.2% | 11.4% | 14.3% |
| Banana | 3.7% | 0.0% | 1.0% | 0.0% |
| Cocoa | 1.1% | 95.0% | 2.6% | 100.0% |
| Coffee | 11.3% | 81.9% | 21.1% | 80.9% |
| Sugar Cane, Panela[1], & Other Uses | 12.8% | 4.7% | 9.4% | 46.7% |
| Coca | 2.7% | 100.0% | 1.8% | 100.0% |
| Flowers | 5.4% | 0.0% | 0.0% | |
| Fruit Trees | 10.1% | 70.0% | 5.3% | 72.0% |
| Vegetables & Beans | 4.9% | 73.3% | 5.1% | 87.0% |
| Corn | 4.5% | 39.7% | 14.3% | 73.8% |
| Other | 0.6% | 69.9% | 0.4% | 100.0% |
| Plantains, Tubers, & Roots | 23.7% | 89.9% | 18.0% | 92.4% |
| Soy, Sorghum, Palm oil, Sesame, Peanuts, & Other | 6.6% | 11.2% | 7.2% | 28.3% |
| Wheat, Barle, & Other | 0.1% | 88.7% | 0.5% | 97.9% |
| Country Total | 100% | 52.0% | 100% | 66.7% |

[1]Panela is a product made from crushed sugar cane. Juice is collected, boiled, and then poured into molds, where it hardens into blocks.

Note: 2010 production value in purchasing power parity represented in dollars. Area harvested in hectares.
Source: agricultural statistical yearbook. Ministry of Agriculture. Agronet. UNOC Coca Census 2009. ENA, DANE. The calculations are our own.

The stability of family farming is, in our opinion, sustained by three main factors: its adaptive capacity in changing economic conditions, its lesser link to markets with products sensitive to international competition (in relation to medium and large-scale business agriculture), and, as we will see in Chapter 3, its economic efficiency.

### 1.2 Conceptualizing family farming

Some definitions of family farming are outlined with the conception that the authors have specified what ideally should be classified as family farmers or countrymen, considering that both work almost exclusively with family members and very marginally with hired workers, and that they favor production aimed at self-consumption and exchanges with neighbors or local markets. Furthermore, they maintain that these farmers rarely use agrochemical inputs and motor machinery and tend to conserve natural resources. In short, as a notable contemporary treatise writer affirms, they adopt the strategy of departing from the markets of massive consumption of agricultural products and industrial inputs (Van der Ploeg, 2010).[2] In the case of Colombia, it is remarkable that the same vision has been proposed in a recent document of the *Comité de Impulso al Año de la Agricultura Familiar 2014* (Committee for the Yearly Promotion of Family Farming in English), which brought together members of the government sector, civil society organizations and academia (AIAF, 2015: 21-22).

Contrary to this way of seeing things, it has been suggested for several decades that family farming is increasingly integrated into the market and is part of a wide range of rural households' economic strategies. Lamarche (1994) gathered evidence from various countries and concluded in 1992 that family farming was a polymorphic reality and the peasant model is only one of the forms it takes, in addition to not being the most frequent. It has also highlighted enormous technological and productive heterogeneity, massive processes of small farmers adopting green revolution technologies, extremely high rates of hiring workers in many cases, and the provisions of massive food supplies to cities and international markets - coffee and cocoa, for example - in several Latin American countries. Thus, in Colombia, coffee, which is the main agricultural export product, is worked by around 80% of small producers (see the evidence for Colombia in this regard, in Forero, 1999 and 2010), and in Table 2 the high degree of intervention of Colombian family producers in the markets for agricultural products (percentage of agricultural income), work (percentage of wages paid) and inputs (percentage of monetary costs) can be appreciated. These cases will be analyzed in section two.

[2] Arturo Escobar, in his highly reputed work, *The Invention of the Third World*, echoes the same idea, arguing that the mistake of public policy has been to try to link farmers to markets, since they, according to this vision, manage to consolidate away from these initiatives, especially from the offer of green revolution.

**Table 2**
**Colombia: Distribution of Colombian family farming studied cases according to the monetary percentage of income, costs and work**
**(percentage)**

| Range % | % Monetary Income | % Monetary Cost | % Paid Daily Wages |
|---|---|---|---|
| 0% | 0 | 0 | 3 |
| 1% To 33% | 0 | 7 | 8 |
| 34% To 66% | 38 | 28 | 10 |
| 67% To 99% | 5 | 26 | 6 |
| 100% | 0 | 0 | 0 |
| Total Cases | 43 | 61 | 27 |

Notes: i) the percentage of monetary income corresponds to the value agricultural products sales over total income, so that the difference with 100% is the weight of self-consumption, percentage of monetary costs are cash payments for inputs and labor over total costs, and the percentage of paid wages represents the participation of hired labor in the total work employed. Self-consumption is valued at consumer prices and unpaid family work is monetized according to the wages in effect in the area. ii) The differences in the total number of cases are due to the existence of cases without complete information. iii) The formulas and variables to find the indicators are found in annexes 2 and 3.

Sources: Forero, 1999; Forero *et* al., 2000; Forero *et* al., 2002; Forero *et* al., 2003; Forero *et* al., 2004; Paz, 1999; Amaya, 1998; Forero *et* al., 2015; Cuellar, 2010.

As in several of our studies, the current essay takes the expression 'family farming' in a broad sense that encompasses both the so-called farmer economy and all kinds of small-scale farming activities, in which the family, or the individual producer, is the axis of the business organization and works – they or their family – personally cultivating produce so that their contribution in labor represents a saving in labor costs. In particular, farmers are family producers who view land not only as a productive asset, but also as a family heritage, either cultural or symbolic, and belong to a rural community in which they have active relationships. In this sense, farmers differ from 'capitalist family businesses', as Llambí (1998) calls them, because land, like other productive factors, must be valued or made profitable due to its opportunity cost and it does not necessarily maintain organic relationships with rural communities. In this business model of small-scale agriculture, in which although the farm manager's work is key, the organization of the family is independent from the agricultural business. This type of work is nowadays very common in both industrialized and Third World countries.

That being said, we carried out an investigation with the purpose of gaining information on family farmers, whose data are presented in the third section (Forero, *et* al., 2013) of the present essay. From the sample we established a producer category according to the extent of the land and crops, so that the size of their farms is less than a family agricultural unit, as calculated by government entities in each municipality, and crops of a size smaller than that proposed by the Ministry of Agriculture determine the farm's size as small-scale production. Results found that among the small producers stratified in this way, more than 60% did not work directly on their crops, that is, they are not strictly family producers. With complementary observations in the field, we

confirmed this fact. We have formed the idea that this is a transitory phenomenon caused by a favorable price situation that generates high surpluses, and we think that, as the incomes of these producers deteriorate, they will return to work personally on their crops, replacing the temporary hired labor.

As we said, the purpose of this study is to account for family farmers regardless of whether they are countrymen or not. Following this train of thought, the agricultural production systems of family farmers make up our key focus of analysis. In the second section, the data analyzed strictly corresponds to farming producers, while the producers that we present in the third section are listed under the name of relatives, including farmers and non-farmers.

Family farming is carried out in what we —and other authors— call an agricultural production system , defined as:

> "An entity whose purpose is the production of agricultural goods and services (forest products, agro-industrial products and fish farming) regulated by an agent (family, individual, business organization) who makes decisions with a certain degree of autonomy and conditioned by socio-economic, political, cultural and environmental factors. The system as a productive unit can be spatially fragmented and access to land can occur simultaneously under various forms of tenure (ownership, leasing, usufruct, associations and partnerships) (Forero *et* al., 2002).''

Said system has inputs, outputs and goes through cycles according to the decisions of the regulatory agent and the institutions that modulate interactions between social actors. In other words, the agricultural production system is a socio-ecological system. In regard to family farming, the regulatory agent is the family.

The rural family farming production system is usually only one of several activities in a rural household. We isolate this system from other household activities to analyze its economic dynamics and establish the income it generates for the rural household, in order to establish its viability, its efficiency, and its contribution to overcoming poverty.

Consequently, the data presented in the second and third sections correspond to the economic balances of family farming production systems. The third section compares the balances of family producers with those of other types of producers (small non-family producers and large and medium-sized entrepreneurs).

## 2. Surplus and Labor Compensation in Family Farming

We compiled results corresponding to the economic balance of the family production systems of sixty-one case studies, which are taken from nine investigations, carried out from 1990 to 2013 in various regions within the country that correspond to different socioeconomic, ecosystemic and productive contexts in which agrarian family production is developed (Table 3). Six of them were carried out directly by the Production and Conservation Systems Group and the other three correspond to coursework led by the leading researcher of the current group.[3] All of these cases correspond to farming production because, according to our definition, the land - and the productive facilities – stem from family (cultural) heritage. As can be seen in Table 3, the cases studied have been classified in different ways, according to their dimensions and their productive dynamics.

In order to collect and synthesize the results of the sixty-one cases, a standardized database was built from which common economic indicators were calculated: family production surplus, daily compensation for domestic work, and profitability.[4]

The cases were identified by types of producers, who represent different forms of organization in terms of production systems, types of land tenure, farm size and scale of agricultural activity; likewise, for each case, the main agricultural activity was determined. It was possible to proceed this way because every study had the common objective of evaluating the economic viability of family production systems and implemented a similar economic valuation model that allowed for the aggregation and comparison of results.[5]

**2.1 Family surplus production and poverty lines**

Considering that the purpose of the family production system is to obtain a surplus that contributes to household income, we established a first indicator that we call the family production surplus (FPS), which is equal to the sum of monetary income (sales) and non-monetary -self-consumption – minus monetary costs (including paid work). Since the value of family labor — unpaid wages — is not subtracted to calculate this indicator, this surplus is equivalent to what is actually left for families as a product of their work on farms.

We call the family technical production surplus (FTPS) that which is obtained before subtracting the rent that some producers pay for access to land when they cultivate on other lands - leases, sharecropping and shared property lines - and for access to capital (interest payment to banks or private lenders). We use the word technical because it is what the system generates regardless of how the surplus is distributed (between the direct producer or farmer and those who contributed land or capital).

On the other hand, the result obtained from subtracting incomes has been named net family production surplus (NFPS), which corresponds to the income that remains for the farmer (and their family) after transferring the rent to those who contributed land or capital when partially or totally lacking the necessary resources (see annexes 2 and 3).

[3] Master's thesis in Rural Development, Bogotá, Universidad Javeriana, Faculty of Environmental and Rural Studies, led by J. Forero Á.

[4] In some cases the economic indicators were reported in the studies, while in others it was necessary to take the basic variables such as income, costs and wages into account to calculate economic indicators.

[5] It should be noted that the tables in this chapter present different totals because complete information is not available in certain cases because they correspond to studies carried out at different times and for different purposes. Even so, these indicators were calculated with the same variables used in a database that we built exclusively for the current study.

**Table 3**
**Colombia: Region, type of producer and main agricultural product of the sixty-one cases studied**

| Region | Type of Producer | Main Product | Source |
|---|---|---|---|
| Altillanura. Puerto López - Meta | New farmers | Various[a] | Forero, *et* al. (2015) |
| | Family | Pineapple, poultry and eggs | |
| | Traditional farmer | Livestock & pigs | |
| Cajamarca (Cuenca Anaime) - Tolima | Small affiliate of Colanta | Bovine livestock | Forero, *et* al. (2003) |
| | Medium affiliate of Colanta 1 | Bovine livestock | |
| | Medium affiliate of Colanta 2 | Bovine livestock | |
| | Traditional small producer | Bovine livestock | |
| Hoya del Río Suárez | Panela sharecropper[b] | Panela | |
| | Independent panela farmer | Panela | |
| Villapinzón - Cundinamarca | Small independent | Potatoes | |
| | Medium independent | Potatoes | |
| | Medium leased | Potatoes | |
| Une - Cundinamarca | Medium independent | Potatoes | |
| | Medium leased | Potatoes | |
| | Percentage sharecropper | Potatoes | |
| | Associate owner | Potatoes | |
| | Associate sharecropper | Potatoes | |
| Granada - Cundinamarca | Independent producer | Cape Gooseberry | |
| | Associate leased | Cape Gooseberry | |
| | Landless associate | Cape Gooseberry | |
| | Associate owner | Cape Gooseberry | |
| Riosucio - Supía - Caldas | Alternative | Coffee & Bovine | Forero, *et* al. (2004) |
| | Conventional | Coffee & Bovine | |
| Curití - Santander | Alternative | Coffee & Bovine | |
| | Conventional | Coffee & Bovine | |
| Cajamarca (Cuenca Anaime) - Tolima | Alternative | Bovine Livestock | |
| | Conventional | Bovine Livestock | |

| | | | |
|---|---|---|---|
| Guane in Barichara - Santander | Small owner & Sharecropper Regadillo - Carare | Beans | Forero, *et* al. (2002) |
| | Parcel owner in sharecropping and access to communal grazing in Butaregua | Tobacco & Corn | |
| | Mechanized & physical sharecropper – El Llano | Tobacco, Corn & Beans | |
| | Small mechanized sharecropper owner in Guanentá | Tobacco & Corn | |
| Fómeque - Cundinamarca | Greenhouse tomato grower | Tomatoes | |
| | Diversified horticultural producer | Vegetables | |
| | Sharecropper | Vegetables | |
| | Small salaried shareholder | Vegetables | |
| Cuenca Combeima, in Ibagué, Tolima | Horticultural medium producer | Vegetables | Forero, *et* al. (2000) |
| Cuenca alta del Río de Oro in Piedecuesta - Santander | Medium with low productivity | Blackberries | |
| | Medium with high productivity | Blackberries | |
| | Small shareholder with low productivity | Blackberries | |
| | Small shareholder with high productivity | Blackberries | |
| Lenguazaque - Cundinamarca | Small with low productivity | Potatoes | Forero, *et* al. (2000) |
| | Small with medium productivity | Potatoes | |
| | Medium with low productivity | Potatoes | |
| | Medium with medium productivity | Potatoes | |
| | Medium with high productivity | Potatoes | |
| Chachaguí & Buesaco - Nariño | Small producers | Corn & Fique | Paz, (1999) |
| | Medium producers | Corn & Bovine | |
| | Small lean production | Diversified | |
| | Smallholding[c] low productivity | Coffee | |

| | | | |
|---|---|---|---|
| Cuenca alta del Río Guadalajara in Buga - Valle del Cauca | Small with low productivity | Coffee | Forero, *et* al (2000) |
| | Small with medium productivity | Coffee | |
| | Medium with medium productivity | Coffee | |
| Viotá - Cundinamarca | Small | Coffee | Amaya, (1998) |
| | Small | Coffee | |
| | Small | Coffee | |
| Restrepo - Valle del Cauca | Small shareholder | Coffee | Forero, (1999) |
| | Small semi-intensive | Coffee | |
| | Small intensive | Coffee | |
| | Medium family | Coffee | |
| | Coffee farmer - rancher | Coffee | |
| Mitú - Vaupés | Chagra[d] | Yucca | Cuellar, (2010) |

[a] Various: pigs, poultry, cocoa and fruit trees, corn and sesame, bio prepared fertilizers, chilies, goats or sheep, milk and derivatives, livestock.

[b] Sharecropping is contract work by which the owner of a farm or ranch temporarily assigns its use and development, as well as that of the farming equipment, livestock, machinery or working capital, agreeing with the assignee sharecropper to distribute the products by allotments in proportion to their respective contributions. Article 1.579 of the Civil Code, which refers to sharecropping, says: «The lease for sharecropping of farmland, breeding cattle, manufacturing or industrial establishments, will be governed by the provisions relating to the partnership contract and by the stipulations of the parties, and, failing that, by the custom of the land. The contracts would be regulated by Law 49/2003, of November 26, regarding rustic leases.

[c] Smallholding can also be represented as the Family Agricultural Unit (FAU) from Article 38 of Law 160 of 1994, where the term of Family Agricultural Unit is as follows: "Family Agricultural Unit (FAU) is understood as the basic agricultural, livestock, aquaculture or forestry production company whose extension, in accordance with the agro-ecological conditions of the area and with adequate technology, allows the family to remunerate their work and have a capitalizable surplus that contributes to the formation of its patrimony ." Consequently, it could be affirmed that a smallholding is any portion of land minus that determined by the Family Agricultural Unit for each relatively homogeneous area.

[d] Although a chagra is a space provided by indigenous communities to cultivate, its value is not limited to only providing food. The relationship with cultivated plants is thought of in terms of relationships with human beings united by blood or affinity. In this sense, the activities associated with food are not limited technically or practically, but rather are a web of practices, knowledge and behaviors in which interactions with living things such as plants, animals and minerals are repeated, as well as with other entities, such as spiritual owners. Since it is about integrating interrelations (ecosystemic, social and spiritual), the food system includes horticulture, hunting & gathering wild fruits, and fishing, utilizing knowledge and practices that are typical of women and men, in a complementary and interdependent way.
Source: Put together by the authors.

We compare these annual surpluses with the rural poverty lines - we divide them by the value of these lines - to establish to what extent the family agricultural production system contributes sufficient income to the household so that it can overcome poverty. To achieve results, it was necessary to find the current poverty line corresponding to each of the sixty-one cases, for which the poverty value per person for the rural sector was multiplied by the number of household members. In cases where the data on family members was not available, the national average for the rural sector was used, which is 4.2 people. We work with poverty measured by income[6], measured precisely by the poverty line (PL)[7] (without ignoring the importance of other measures such as the multidimensional poverty index [MPI], focused on endowment/lack of capabilities). It goes without saying that the income approach is closely related to the capacity approach, since insufficient income is an obstacle for household members to develop capacities.

In 2012, a methodology change was made in the calculation of poverty, which caused the poverty rate, both in urban and rural regions, to decrease considerably. With this adjustment, the current rural poverty line is 58% of the previous poverty line, so that a person living in a rural area, in order not to be poor in 2014, should live with approximately $4,660 Colombian Pesos (COP) per day ($2.30 U.S. dollars) and spend $2,661 COP per day ($1.30 USD) on food;[8] the latter figure is equivalent to the indigence line and without adjusting the poverty line this year, it would be approximately $7,966 COP ($3.90 USD) and the indigence line would be $3,598 COP ($1.70 USD).[9] To capture these differences, we opt to do our calculations with two lines, namely, the current and the previous one.[10]

[6] There are three main views to approaching poverty: i) as a lack or unmet needs; ii) as insufficient income; iii) as a lack of capacity development.

[7] The calculation of the poverty line starts from the extreme poverty line (EPL), which in Colombia represents the monthly per capita expenditure necessary to acquire a basic food basket, which covers the minimum nutritional requirements according to standards of the Instituto Colombiano de Bienestar Familiar (ICBF) and the Food and Agriculture Organization of the United Nations (FAO). The value of the poverty line (PL) is equivalent to the monthly per capita cost necessary to acquire, in addition to food, other basic goods. The poverty line (PL) results from multiplying the EPL by the Orshansky coefficient (OC), a coefficient that results from dividing total expenditure by food expenditure (Mission for Joining the Employment Series, Poverty and Inequality - Mesep, 2012).

[8] The decrease in the value of the rural poverty line is due to the lower value of the basic food basket and the lesser relationship between spending on food and total spending to estimate the PL (Orshanky coefficient). The Mesep decided to use an exogenous OC with the justification that it was comparable with the average of the countries of Latin America. For the urban area the coefficient was 2.4 - equal to the Latin American average - and for the rural area it was 1.74; in the latter case, Mesep's explanation is that although it is an exogenous OC, the urban/rural proportionality of the endogenous

CO is maintained, however, it should be noted that the average OC of the rural area for Latin American countries is 2.1 (Mesep, 2012).

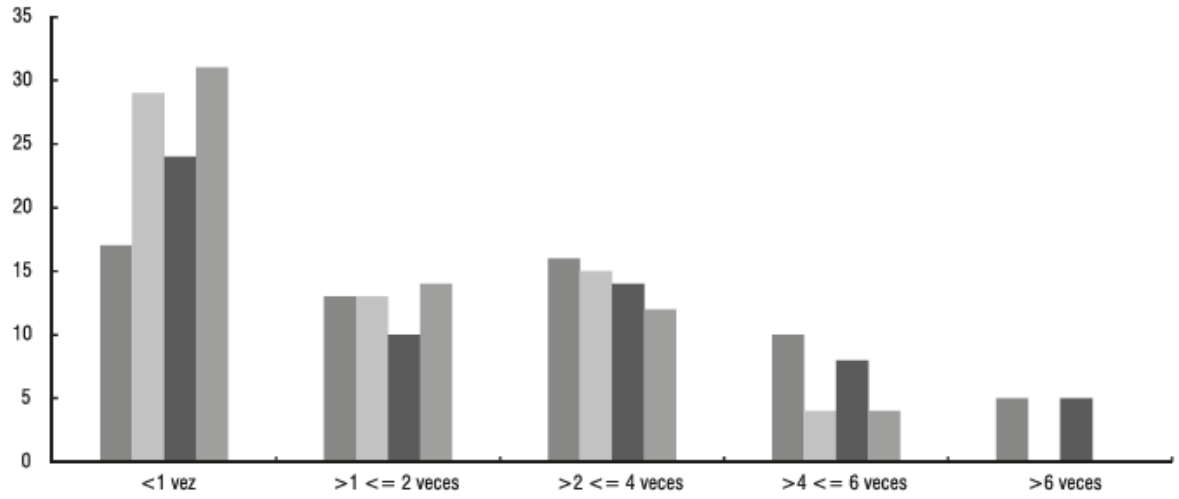
[9] Approximate calculations estimated by the authors.

[10] The poverty line, according to the previous methodology, was calculated in 2005 and was based on the 1994/1995 income and expenditure survey with the information from the first follow-up of the Families in Action Program. The poverty line according to the new methodology was calculated in 2012 and was based on the 2006/2007 income and expenditure survey (Merpd, 2006). While we know that the above line is no longer calculated, we made an estimate for comparison: We took the baseline ($2,005 COP) and updated it with the Low-Income Consumer Price Index (CPI).

Figure 1 shows the distribution of cases studied according to the family surplus of technical and net production that is above or below the current and previous poverty lines.

**Figure 1**
**Colombia: Family technical production surplus and net family production surplus in farming production systems in relation to current and previous poverty lines, cases studied between 1990 and 2013**

(number of cases)




FTPS/CURRENT Poverty Line; FTPS/PREVIOUS Poverty Line; NFPS/CURRENT Poverty Line; NFPS/PREVIOUS Poverty Line

| | Family technical production surplus (FTPS) | | | | Net family production surplus (NFPS) | | | |
|---|---|---|---|---|---|---|---|---|
| | FTPS/Current poverty line | | FTPS/Previous poverty line | | NFPS/Current poverty line | | NFPS/Previous poverty line | |
| Range in number of times the poverty line | Number of cases | % | Number of cases | % | Number of cases | % | Number of cases | % |
| < 1 time | 17 | 28% | 29 | 48% | 24 | 39% | 31 | 51% |
| > 1 <= 2 times | 13 | 21% | 13 | 21% | 10 | 16% | 14 | 23% |
| >2 <= 4 times | 16 | 26% | 15 | 25% | 14 | 23% | 12 | 20% |
| > 4 <= 6 times | 10 | 16% | 4 | 7% | 8 | 13% | 4 | 7% |
| > 6 times | 5 | 8% | 0 | 0% | 5 | 8% | 0 | 0% |
| Total cases | 61 | 100% | 61 | 100% | 61 | 100% | 61 | 100% |

Note: the formulas and variables used to calculate the indicators are explained in annexes 2 and 3.
Sources: Forero, 1999; Forero *et* al., 2000; Forero *et* al., 2002; Forero *et* al., 2003; Forero *et* al., 2004; Paz, 1999; Amaya, 1998; Forero *et* al., 2015; Cuellar, 2010.

It should be highlighted that there are differences in the indicators when they are calculated with one or the other poverty line: if we look at the calculations made with the net surplus, which is, as mentioned, what remains for the family after paying rent, the current methodology shows that agricultural income is below the poverty line in 39% of cases, while with the previous calculation, this percentage rises to 51% of the cases analyzed. It is noteworthy to emphasize that in a high percentage of cases the income generated by family production systems exceed both poverty lines (61% and 49% respectively), which indicates that under certain circumstances family farming does have the potential of overcoming poverty.

It should not be forgotten, however, that, as is well known, the incomes of the families that cultivate the land do not come exclusively from their production systems, but rather, in many cases the members of said households carry out other agricultural activities – those of day laborers[11] – that are not necessarily agricultural, while not infrequently receiving subsidies and remittances. As these incomes were not accounted for, the previous data does not take into account poverty levels of the rural households considered, but the income generated by their farms or plots of land (by means of their agricultural production systems).

Finally, Table 4 shows the distribution of the cases according to their profitability. Unlike the previous indicator, the non-monetary costs derived from the use of family labor are removed.

With this distribution, it is confirmed that most of the analyzed production systems are efficient; only six cases have negative net profitability and three of them would have a positive indicator if producers did not have to pay rent.

**Table 4**
**Colombia: Technical and net profitability in farming production systems, cases studied between 1998 and 2013**

| | Profitability | |
|---|---|---|
| | Technical | Net |
| Profitability range (%) | Number of Cases | Number of Cases |
| >100% | 9 | 5 |
| > 75% <= 100% | 8 | 7 |
| > 50% <= 75% | 7 | 4 |
| > 25% <=50% | 7 | 12 |
| > 0% <=25% | 7 | 7 |
| Negative | 3 | 6 |
| Total cases | 41 | 41 |

Note: the variables and formulas of the profitability indicators are found in annexes 2 and 3.
Sources: Forero, 1999; Forero *et* al., 2002; Forero *et* al., 2003; Forero *et* al., 2004; Forero *et* al., 2015; Cuellar, 2010.

[11] Day laborers are characterized by working and being paid on an hourly basis.

### 2.2 The system's efficiency according to the opportunity cost of family labor

Considering that farmers are not strictly governed by profitability (which is calculated by adding all costs and both monetary and non-monetary income) and taking into account that the purpose of their agricultural production system is to provide income for the family, we established another indicator, equal to the family production surplus (as explained above) divided by the amount of wages earned from the family work: *compensation per day worked.*[12] This indicator shows the efficiency of the system from the point of view of what really interests the family: that their work be adequately paid; in other words, that what they earn on the farm is greater than what they receive working outside it. Now if we compare the labor compensation with the opportunity cost of labor, we obtain an indicator appropriate to the particular conditions of these producers, which accounts for the efficiency of the production system. We mean that a production system is efficient if the family has the capacity to generate an income for each day worked that exceeds what they would earn elsewhere.

Thus, we compare the compensation of family labor with the value of the current legal minimum wage (in the year in which the study was carried out). To this end, we established two measures of the minimum wage: the ordinary daily minimum wage and the full daily minimum wage, categories that we explain below.

*The ordinary daily minimum wage* corresponds to daily legal minimum wage, which is equal to the monthly minimum wage (set on a yearly basis by the central government), divided by thirty days. This is the salary that is normally taken as a reference to pay agricultural day laborers. Nevertheless, we have to inform that those who work daily for an entire month - 23.2 working days - will earn an income equivalent to 82% of the current poverty line for the rural sector and 48% of the poverty line that was in effect before 2011.

*The full daily minimum wage* is what a worker should receive if their social benefits were included in the daily payment, and if the monthly minimum wage were divided not by 30 days (as is currently done), but rather by 23.2 (number of eight-hour days) that a worker works in Colombia employed in accordance with the guidelines of the labor law). Calculated in this way, the complete daily wage is a little more than double the current wage - 2.15 times - and therefore a worker, hypothetically compensated within this range, would generate income equivalent to 167% of the current rural poverty line and 98% of the previous' line.[13]

Figure 2 shows the distribution of the cases analyzed according to whether they are above or below the ordinary daily and full daily minimum wage.

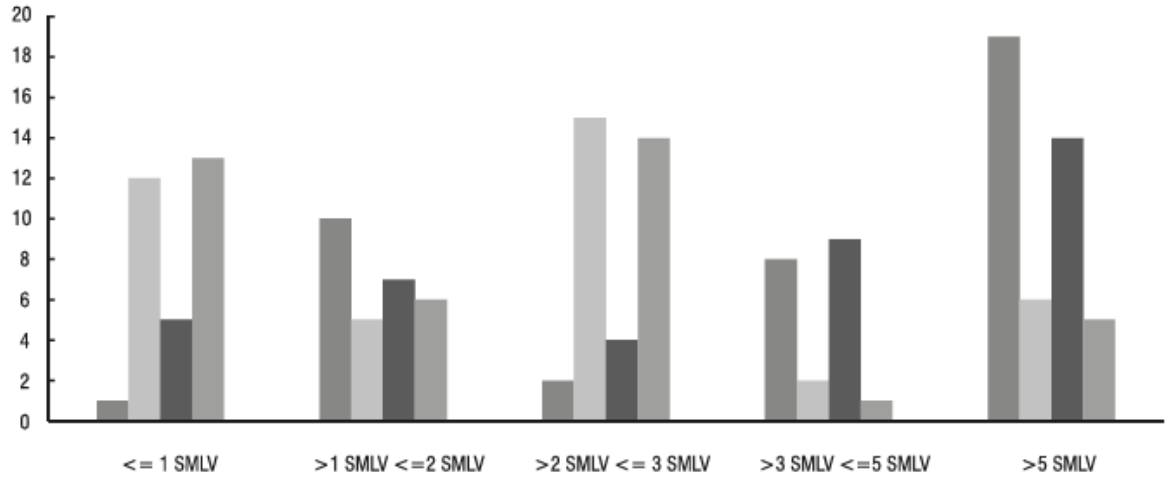
[12]The remuneration per working day, insofar as it includes the implicit remuneration of capital —which is subtracted when interest is actually paid— and the opportunity cost of land —which is subtracted only when the farmer pays rent or sharecropping fees – does not strictly correspond to compensation for work (as a component of added value), but considering that in family systems land is primarily a cultural heritage (basic in the social reproduction of a farming family), and that agricultural assets are part of the family heritage, this indicator is suitable for family farming .

[13]This poverty line is calculated for a household of 4.2 people (rural national average).

**Figure 2**

**Colombia: Daily technical and net compensation for domestic work in farming production systems in relation to ordinary and full minimum wages, cases studied between 1990 and 2013**

(number of cases)




(range in number of minimum daily salaries)

TCDWD/CLMW[1] ordinary; TCDWD/CLMW full; NCDWD/CLMW ordinary; NCDWD/CLMW full

| | Technical compensation per domestic workday (TCDWD) | | | | Net compensation per domestic workday (NCDWD) | | | |
|---|---|---|---|---|---|---|---|---|
| | In ordinary minimum wage | | In full minimum wage | | In ordinary minimum wage | | In full minimum wage | |
| **Range in number of current legal minimum salaries (CLMW)** | **Number of cases** | **%** | **Number of cases** | **%** | **Number of cases** | **%** | **Number of cases** | **%** |
| **<= 1 CLMW** | 1 | 3% | 12 | 30% | 5 | 13% | 13 | 33% |
| **> 1 CLMW <= 2 CLMW** | 10 | 25% | 5 | 13% | 7 | 18% | 6 | 15% |
| **> 2 CLMW <= 3 CLMW** | 2 | 5% | 15 | 38% | 4 | 10% | 14 | 36% |
| **> 3 CLMW <= 5 CLMW** | 8 | 20% | 2 | 5% | 9 | 23% | 1 | 3% |
| **> 5 CLMW** | 19 | 48% | 6 | 15% | 14 | 36% | 5 | 13% |
| **Total cases** | 40 | 100% | 40 | 100% | 39 | 100% | 39 | 100% |

[1]CLMW is translated from the Spanish acronym: SMLV (Salario Mínimo Mensual Legal Vigente), meant to represent Current Legal Minimum Wage.

Notes: differences in total cases are due to the existence of cases without information. The variables and formulas used to calculate the indicators are explained in annexes 2 and 3.

Sources: Forero, 1999; Forero *et* al., 2000; Forero *et* al., 2002; Forero *et* al., 2004; Forero *et* al., 2015; Paz, 1999; Cuellar, 2010.

The Technical Compensation per Domestic Workday (TCDWD) in 97% of cases is higher than the ordinary minimum wage (without benefits and without considering rest days and holidays, as explained). This means that in general the analyzed family production systems are efficient (they compensate their labor more than their opportunity cost before subtracting income). Now, with the Net Compensation per Domestic Workday (NCDWD) in ordinary wages (subtracting the rents paid), things do not change significantly: 87% of cases are above the minimum wage, which means that in most cases, the income generated by the families is also greater than their opportunity cost. Note that there are very high compensations: 52% of the cases obtain an income per day greater than three full minimum wages (including benefits and days off). Producers dedicated to coffee, dairy cattle, and fruits and vegetables stand out as having good compensation (see annexes 6 and 7). These products are what the literature calls 'surface savers'. These systems support the payment of land and capital rents in 87% of the cases since only 13% have a compensation day, after paying rents, which is below the current daily minimum wage.

On the other hand, with the data from a recently completed doctoral thesis, we calculated similar indicators for family farmers who obtain high profitability in greenhouse crops of vegetables and in full exposure based on the adoption and adaptation of green revolution packages. Vegetables are irrigated, in most cases, with informal irrigation systems implemented by farmers without the intervention of engineers or experts. These producers, located in Fómeque[14] (Cundinamarca), exemplify cases of a successfully evolving process that has established this area as a prosperous family farming region. In these production systems, characteristic features of farming culture and what could be called modern business agriculture coexist and complement each other, such as the relationship between commercial and self-consumption agriculture and the high use of contracted work combined with family work. The existence of reciprocal work exchanges, services and food products in the midst of a highly integrated economy, also account for a coexistence of tradition with modernity (Gutiérrez-Malaxechebarría, 2014: 141).

**Table 5**
**Economic indicators for three zones of horticultural producers in the municipality of Fómeque (Cundinamarca), prices and minimum wage values in Colombian pesos from 2011**

| Indicator | Value | Coeficient of variation (percentage) |
|---|---|---|
| Average size SP (Ha) | 2.8 | 5.37 |
| Irrigated cultivated area / total cultivated area (%) | 70.3 | 3.65 |
| Family labor / total labor (%) | 43.1 | 5.52 |
| Total net income / daily wages | 111,506 | 5.92 |
| NCDWD / ordinary minimum wage | 14.49 | 8.13 |
| NCDWD / full minimum wage | 7.03 | 8.13 |
| Average agricultural family surplus / current poverty line | 7.44 | |
| Avarage agricultural family surplus / previous poverty line | 5.86 | |

Source: Gutiérrez-Malaxechebarría, 2014b.

[14] When asking a successful farmer from Fómeque if he considered himself a farmer or an entrepreneur, he did not hesitate to affirm that it was both at the same time, "Farmer because I live in countryside and work in the fields, because the fields are my life; entrepreneur, because I do my best to make money from the money I invest."

The results presented in Table 5 reflect the very high producer efficiency. Statistical analyses showed that there are no differences between producer sizes, nor between other types of groups, so it can be stated that these results are generalized within the sample of farmers analyzed (in an area of Fómeque)[15]. Clearly, we are facing an outstanding case - but it is not completely exceptional in Colombia - and, therefore, it should not be taken as a norm, but it does allows us to argue, however, that when favorable conditions such as access to markets, knowledge of the activity and adequate circulation of production factors, family farming is successful. This approach will be reinforced with new information in section 3.

In the cases analyzed, of which we have information (including the producers of Fómeque, whom we have just previously referred to), the local agricultural wage is higher than the ordinary minimum wage and less than the full wage as shown in Table 6. This table illustrates a very frequent situation in family farming regions: the local wage is above the ordinary daily wage and below the full wage. From this we are able to confirm that family farming is highly efficient in 66% of cases as it compensates labor above its opportunity cost. Now if we take the current minimum wage as a standardized measure for the country, the opportunity cost of the unpaid labor employed in family farming is efficient in 87% of the cases, but it must be considered that the opportunity cost of the family workforce can be much lower —trending towards zero — for part of the family work carried out by people who cannot leave the house —women, housewives, the elderly— or who carry out their agricultural activities over short periods of time independently of their studies or their main jobs. This being the case, our efficiency indicator - the compensation of work / minimum wage - would tend to be undervalued, so that the conclusions derived from the high efficiency of these family farming cases are solidly supported by the data presented.

[15] Apart from grouping by size (small and very small), it was stratified by type of irrigation - informal, formal and semi-informal - by means of a multiple correspondence analysis, followed by a classification analysis by Ward's method, combined with expert criteria. The sample size was calculated in order to obtain a sampling error of less than or equal to 6%, with a reliability level of 94% for the productivity estimator (net income / agricultural area).

**Table 6**
**Colombia: Value of local daily wages in 2014 prices in relation to ordinary & full minimum wages in some of the studied regions**

| Year | Region | Daily wage value (COP, 2014) | Daily wage value/ Full minimum wage | Daily wage value/ Ordinary minimum wage |
|---|---|---|---|---|
| 2013 | Altillanura . Puerto López - Meta | 30,582 | 0.74 | 1.53 |
| 1991 - 2002 | Riosucio . Supia - Caldas | 12,.773 | 0.35 | 1.13 |
| | Curití - Santander | 15,168 | 0.42 | 1.34 |
| | Cajamarca (Cuenca Anaime) - Tolima | 21,555 | 0.59 | 1.91 |
| 1990 - 2000 | Guane - Santander: Regadillo - Carare & Butaregua | 18,555 | 0.51 | 1.91 |
| | Guane - Santander: El Llano | 25,103 | 0.69 | 2.58 |
| | Guane - Santander: Guanenta | 20,738 | 0.57 | 2.13 |
| | Fómeque - Cundinamarca | 26,196 | 0.73 | 2.70 |
| 2009 - 2010 | Mitú - Vaupés | 34,085 | 0.86 | 1.95 |

Sources: Forero *et* al., 2002; Forero *et* al., 2004; Forero *et* al., 2015; Cuellar, 2010.

The previous findings regarding family farmers' incomes diverge widely from data based on the *Gran Encuesta Integrada de Hogares* (GEIH, or Large Integrated Household Survey in English), which is used for official poverty estimates in Colombia. It so happens that the questions in this survey, which are aimed at knowing the income of family farmers' farms or production systems, are inadequate. In fact, the question being asked is the following, ''What was the net profit of the business or the harvest over the last twelve months?'' This brings about multiple possibilities of response, since in the 'microeconomics' of family farming, the producer organizes him/herself to obtain an income and not a profit, so that the profit that is intended to be gained does not exist in practice for many farmers, or is at least lessened. In addition, with this question, agricultural income is reduced to a single estimate, which prevents accurately identifying the diversity of activities and productive arrangements developed in the various farms of the agricultural production system. This prevents a proper quantification of monetary and non-monetary income - self-consumption— from each productive activity and from the farm as a whole.

Thus, the estimates based on the GEIH show that self-employed agricultural producers, that is, family farmers, receive the lowest income per occupational position in the rural sector, far exceeded by the compensation of day laborers (Merchán, 2014; MTC, 2015). It has been found that the average level of income per worker in the farming sector is one third of the current legal minimum wage - CLMW (MTC, 2015), a result that contrasts with our findings, according to which,

as we have previously shown, family farmers obtain a compensation per working day much higher than the CLMW. In short, the possibilities of obtaining agricultural income from this survey are very limited, while our data has been obtained through exhaustive and rigorous field work —with complete economic balances for each producer— in different regions of the country.

We are aware that the data presented in this study correspond to particular cases that cannot lead to generalizable conclusions, but, as is known, when an indicator systematically takes a value above a certain level, there are very strong indications that the participants — in this case, Colombian family farming, would behave in the same way. That being said, it must be stressed that these are mere indications, as we have no intention of irresponsibly forcing conclusions.

Thus, what can be derived from this analysis is that family farming in various contexts - those studied – is as efficient and there is evidence that this could be a general trend. In chapter three, we will continue to move in this direction supported by further evidence.

The high efficiency of the cases analyzed, measured by the compensation of work, contrasts with indicators that give much less satisfactory results when it comes to the surpluses generated by family production systems (point 2.1). The obvious deduction is that the limited access to factors explains this contrast: the analyzed family production systems are efficient, but due to the limited land available and their limited access to capital, they do not generate enough income to adequately support a family.

It is worth noting that most of the farmers' products analyzed circulate in the open market, as can be seen in Table 7, which means that family farmers do not necessarily have to be linked to agro-industrial chains or productive alliances with formal operators to obtain competitive prices for their crops. The open market is made up of a very complex network of informal merchants, ranging from rural intermediaries to shopkeepers, merchants in marketplaces and street vendors in cities, whose center of operations is in the wholesale downtown districts in large cities and market squares of intermediate cities.

The wholesalers of the supply centers in big cities —and especially Corabastos in Bogotá— make up the regulatory center of this marketing system. The available evidence (Forero, 2006) shows that this informal sector places products from family farming —fruits, vegetables, tubers, bananas, panela, beans, etc.— at a price that is close to half of that charged by the formal system - supermarkets and hypermarkets - for these same products (without any significant difference in quality).

**Table 7**
**Market types in production systems studied from 1990 to 2013**

| Year | Region | Main product | Agents that buy the product | Type of market |
|---|---|---|---|---|
| 2013 | Altillanura . Puerto López - Meta | Several | Urban traders, wholesalers, and consumers | Open |

| | | | | |
|---|---|---|---|---|
| 2002 | Cajamarca - Cuenca Anaime - Tolima | Milk | COLANTA (Agro-industrial cooperative) | Closed (regulated by pre-established contracts of obligatory compliance) |
| 1997 - 2002 | Hoya del Río Suárez | Panela | Rural intermediaries | Open |
| 1999 - 2002 | Villapinzón - Cundinamarca | Potatoes | Rural intermediaries and CORABASTOS wholesalers | Open |
| 1999 - 2002 | Une - Cundinamarca | Potatoes | | |
| 2002 - 2003 | Granada - Cundinamraca | Cape gooseberries | Rural intermediaries, CORABASTOS wholesalers and exporters | Open |
| 1991 - 2002 | Riosucio - Supia - Caldas | Coffee | Cooperatives of coffee growers and private intermediaries | Open with purchase guarantee |
| | Curití - Santander | Coffee | | |
| | Cajamarca (Cuenca Anaime) - Cundinamarca | Milk | COLANTA (Agro-industrial cooperative) | Closed |
| 1990 - 2000 | Guane en Barichara - Santander | Tobacco | Tobacco companies | Closed |
| | Fómeque - Cundinamarca | Vegetables | Rural intermediaries, CORABASTOS wholesalers and a small percentage of supermarkets | Open but closed when selling to supermarkets |
| 1998 - 1999 | Cuenca del río Combeima en Ibague - Tolima | Vegetables | Rural intermediaries | Open |
| 1998 - 1999 | Piedecuesta - Santander | Blackberries | Rural intermediaries | Open |
| 1998 | Lenguazaque - Cundinamarca | Potatoes | | |
| 1998 | Chachaguí y Buesaco - Nariño | Corn | | |
| 1998 | Buga - Valle del Cauca | Coffee | Cooperatives of coffee growers and private intermediaries | Open with purchase guarantee |
| 1995 | Viotá - Cundinamarca | | | |
| 1999 | Restrepo - Valle del Cauca | | | |
| 2009 - 2010 | Mitú - Vaupés | Yucca - Plantains | Traders | Open |

Sources: Forero *et* al., 2000; Forero *et* al., 2002; Forero *et* al., 2003; Forero *et* al., 2004; Paz, 1999; Amaya, 1998; Forero *et* al., 2015; Cuéllar, 2010.

## 3. Microscale economies and rural poverty

### 3.1 The economic efficiency of family farming versus business

There are many doubts about the economic efficiency of family farming and its potential to generate income for rural households that can contribute to overcoming rural poverty. There are also many authors who – both with and without evidence - have spoken out against that claim.

We have found, as shown in the previous section, that family farming is efficient and generates, in most of the cases studied, income above the current legal minimum wage (CLMW). We will delve further into this topic by comparing Colombian family producers with medium and large-sized producers from two studies.

The first of these studies, which was carried out in 2005, seeks to analyze the competitiveness of dairy farmers and corn growers integrated into the balanced food chain and establish their possible situation concerning the free trade agreement with the United States (see Table 8).

**Table 8**
**Colombia: Profitability for family, medium and large producers integrated into the dairy and balanced food chain, 2005**
**(percentage)**

| Region | Type of producer | Product | Technical profitability % (Excluding land) | Net profitability % (Excluding land) |
|---|---|---|---|---|
| Norte de Antioquia | Family | Milk | 117% | SD |
| | Medium | Milk | 45% | SD |
| | Large | Milk | 52% | SD |
| Ubaté and Chiquinquirá | Family | Milk | 83% | SD |
| | Medium | Milk | 72% | SD |
| | Large | Milk | 67% | SD |
| Cesar | Large | Dual-purpose livestock | 69% | SD |
| San Luis, Tolima | Family | Corn and Sorghum | 51% | 18% |
| | Medium | Corn and Sorghum | 26% | 4% |
| | Large | Corn and Sorghum | 67% | 32% |
| Altillanura | Family | Corn and soy | 24% | 4% |
| | Large | Corn and soy | 48% | 43% |
| Cereté, Córdoba | Family | Corn and cotton | 39% | 22% |
| | Medium | Corn and cotton | -3% | -10% |
| | Large | Corn and cotton | 17% | 4% |

Source: Forero *et* al., 2007.

We were surprised by the findings of this study (Table 8), because, despite having lower productivity compared to the medium and large producers, family producers obtained higher returns in only two cases, that of the Altillanura (24% *vs.* 48%) and San Luis (51% *vs.* 67%). Their

profitability was lower than that of the large producers, although San Luis, with its corn - sorghum rotation, had a higher profitability than that of the medium producers. It is noteworthy that in three regions the medium-sized producers had a much lower economic balance than both the large and the family producers. This may lead some to think that situations are typified in which the medium producers do not have the advantages of the large ones or those of the families, but obviously these case studies are just indications of a general trend, as stated above. We attempted to overcome this methodological obstacle in a new investigation, in which we were able to achieve a good statistical representation.

This second study was carried out in 2012 (Forero *et* al., 2013) with the express intention of comparing the economic efficiency of family farmers with that of medium and large farmers in regions in which these three groups had similar conditions in terms of technological packages, agro-ecological characteristics, socioeconomic environments and infrastructures. In the twelve regions where the research was carried out, the selected crops presented high productive dynamism. The choice was made with two criteria in mind: that they should be those of greatest economic importance in the Colombian context, and that the three types of agricultural producers should be present. The regions were randomly selected and each one had a representative sample of producers, who were stratified by size. A total of 1,388 surveys were processed.

The crops and selected regions were: coffee in Belén de Umbría (Risaralda) and Ciudad Bolívar (Antioquia), mechanized rice in Cabuyaro (Meta) and Majagual (Sucre), plantains in Quimbaya (Quindío) and Fuente de Oro (Meta), palm in Sabana de Torres (Santander) and El Retén (Magdalena), potatoes in Chocontá (Cundinamarca) and Ipiales (Nariño) and modified corn in María La Baja (Bolívar) and Granada (Meta).

Technical profitability — without subtracting rents— and net profitability — which includes the rent paid by producers — were the most important indicators used to establish the economic efficiency of these production systems. Tables 9 and 10 show the main results.

**Table 9**
**Colombia: Profitability of production systems and main crop, in ten regions**

| | **Number of producers** | **Net profitability** | **Technical profitability** | **Technical efficiency of land use** |
|---|---|---|---|---|
| | | | | **COP per hectare (2012)** |
| Family | 289 | 45% | 48% | 1,830,080 |
| | | *9%* | *9%* | *15%* |
| Large | 116 | 48% | 51% | 2,803,847 |
| | | *13%* | *13%* | *14%* |
| Medium | 249 | 48% | 51% | 2,551,618 |
| | | *10%* | *10%* | *12%* |

| | | | | |
|---|---|---|---|---|
| Small, Non-Family | 743 | 55% | 58% | 3,026,582 |
| | | *5%* | *5%* | *6%* |
| Total Cases | 1388 | 51% | 54% | 2,673,634 |
| | | *4%* | *4%* | *5%* |
| Differences | | **FP | **FP | **FG*FM |
| | | | | ***FP |
| Farmers | 238 | 45% | 42% | 1,642,432 |
| | | ***CP | *CP | **CG**CM***CP |

Notes: FP: Significant differences between family and non-family small. FG: Significant differences between family and large. FM: Significant differences between family and medium. CP: Significant differences between farmers and non-family small. CG: Significant differences between farmers and large. CM: Significant differences between farmers and medium*** at 1% (extremely high level of probability of finding differences) ** at 5% (very high) * at 10% (high). Coefficients of Variation (CV) in italics.
Source: Forero *et* al., 2013.

**Table 10**
**Colombia: Net agricultural income / rural poverty line, in ten agricultural regions (2012)**

| | **Ten Regions** | | | | |
|---|---|---|---|---|---|
| | Large | Medium | Small | Average differences | Total |
| Net agricultural income | 44.11 | 6.59 | 1.58 | ***GM | 6.03 |
| Poverty line | *2%* | *14%* | *4%* | GP MP | *5%* |

Notes: GM: significant differences between large and medium. GP: significant differences between large and small. MP: significant differences between medium and small. *** at 1% (extremely high level of probability of finding differences). Coefficients of Variation (CV) in italics.
Source: Forero *et* al., 2013.

This research concludes that — in light of profitability — family producers turn out to be equally efficient as medium and large producers when they have access to acceptable economic conditions and environments. Furthermore, small producers demonstrate not only their efficiency, but also their ability to generate economic development and provide effective solutions to rural poverty (Forero *et* al., 2013). The farmers who constitute a subgroup of the families do not show differences from the medium and large producers, but they do have lower returns than the non-farmer families.

Curiously, and contrary to prevailing literature (see point 3.2), both for family farmers in general and for farmers in particular, the net income per hectare, that is, the efficiency in the use of land, is lower compared to the other groups. We must make the caveat that the studies cited work on physical productivity, while our study focuses on net income, which we consider as a more appropriate indicator in measuring economic efficiency.

The relationship between net agricultural income relative to the poverty line was also calculated, and it was found that small producers obtain net income above the poverty line, but obviously they are well below the income of medium and large producers. The net income / poverty line ratio for the large producers is not included to analyze poverty, rather to simply show the magnitude of their earnings among the selected groups. A notable fact is that these earnings are generated in agricultural units whose size is below the extension of the Family Agricultural Unit (FAU) of each area, which shows that under acceptable conditions the FAU may be oversized.

Subsequently, and based on the information from these surveys, Bernal (2013)[16] applied the Data Envelopment Analysis (DEA) methodology and used the censored Tobit model,[17] under the hypothesis that small-scale agriculture has higher efficiency levels compared to larger farms, and thus found similar results to those found by Forero *et* al. (2013), which indicate that in specialized regions with high levels of agricultural activity, relatively good conditions for production, product marketing, roadways infrastructure, clear titling, and simultaneous presence of small, medium and large producers, agriculture on a small scale has similar efficiency levels to those of medium and large scale agriculture. It was also established that the contribution of family labor stands out in determining efficiency and there is also a positive correlation between efficiency and crop diversification (Bernal, 2013).

**3.2 Economies of scale, microscale economies**

The evidences shown in the data in Tables 8, 9 and 10 reveal that there is no superiority in the economic efficiency of large producers compared to family producers; but also, generally speaking, there are no significant differences between them. In addition, multiple data indicate that family farmers use available land more efficiently than large producers, as a consequence of the application of higher levels of family labor (see a compilation of sources in this regard in Bejarano, 1998). According to these same sources, the large producer, in several cases, spends four or five times more per hectare on inputs than the family producer, but produces less. It has also been pointed out in various studies of Third World countries, in which Colombia is included, that small producers tend to take advantage of intensively using land more so than their larger counterparts by dedicating, as seen in Colombia, less area to extensive livestock farming and more to agriculture — yield per unit of land decreases with increasing farm size, which tends to reduce total production (Bejarano, 1998). Berry (2011) argues that the high productivity of land by family producers can be explained by factors such as: i) less land area left unused on smaller farms, ii) greater harvests obtained per year due to the intensive use of the area; iii) higher agricultural value generated per cultivated area, and iv) they sometimes present higher yields.

[16] Master's theses in Economics, supervised by Jaime Forero, Universidad Javeriana. Unpublished work.
[17] This model allows for efficient and consistent estimations to be obtained for models in which the dependent variable is limited because it takes values between zero and one and has complete observations of the sample.

In this sense, some authors suggest that there are diseconomies of scale because small producers have higher productivity: the smaller the farm, the higher the productivity (Berry & Cline, 1979; Lipton, 2009; Berry, 2014). The inverse relationship between production unit size in terms of area — and productivity per hectare has been widely observed in many countries throughout Asia, Latin America, and Eastern Europe (Bardhan, 1973; Carter, 1984; Feder, 1985). For example, Bardhan, analyzed cases in India and found that small production units based on family labor have better results if they concentrate their work on the farm itself, therefore utilizing more of their own labor per amount of land, which generates higher yields per hectare. Similarly, other authors argue that small farms are more efficient than large ones (Boyce *et* al., 2005; Breton, 1993). Breton affirms something that we have observed in the Colombian context (see point 2.3): "Family farmers leave less land uncultivated, have dedicated themselves to producing crops with higher added value and greater intensity of work such as vegetables, and they are successful in producing higher yields per unit of land by dedicating more time and care to their crops." The inverse relationship, in this case, is based on the differences in unit transaction costs that would favor small farms, especially those of Third World countries, because the cost of labor is lower (Berry, 2014). Leibovich *et* al. (2013: 200) found that the value of the 'yield per hectare' (in pesos) is higher in small farms than in large ones in Colombia; however, these authors aggregate all producers and compare them without distinguishing their productive systems in such a way that the low productivity of extensive cattle raising distorts the results in relation to the farmers. In other words, they do not take into account that agricultural and extensive livestock systems are completely different, so the data from these authors are valid to point out differences in land use, but not to compare economic efficiency between different types of farmers.

The greater productivity of the large producers also has its defenders, as the review written by Leivobich *et* al. (2013: 200-201) shows. In some cases, it has been argued that, under optimal conditions, large producers are more productive because they have greater capacity to introduce innovations. Breton (1993) argues that within systems in which production is highly mechanized, with minimal participation of labor, costs per unit area decrease and economies of scale arise.

Finally, authors such as Barnum and Squire (1978) reject the hypothesis of diminishing returns to scale and, based on estimates of the production function, conclude that the technical efficiency of small and large production units is the same, which is consistent with the results we have obtained.

With our data (Tables 8, 9 and 10), it is not possible to take sides with those who consider that small scale - or family - agriculture is more efficient than large agriculture, or those who argue otherwise. We would take an intermediate position, and according to the evidence shown in Colombia, we have proposed (Forero, 2010 and especially 2013) that although the large producers

have economies of scale, the small producers work with micro-scale economies. The fact is that, on one hand, large agricultural production has important advantages derived from organizing production factors that take advantage of some economies of scale. Business agriculture capitalizes on its larger dimensions by intensifying mechanization and saving labor, while buying inputs at lower prices compared to small producers. On the other hand, family farming production manages to develop 'micro-scale economies' that derive from their particular way of applying resources and managing agricultural and livestock processes, which enables them to reduce costs and sometimes increase productivity. Micro-scale economies arise, then, from the direct relationship of small producers with their cultivation plots of land and their animals, which lead them to implement specific management practices that result in an efficient use of their labor, as well as from hired workers and farm resources (Forero, 2010). Below we list some strategies of family farmers that have an impact on obtaining micro-scale economies:

- Associations of crops typical of small production, a practice that is well documented in the prevailing literature. Examples of these are the association of corn with beans; potatoes with green peas; coffee with plantains, ice-cream-beans and other tree species.
- When the small producer performs fertilization and phytosanitary control, they manage to fertilize and control pests more efficiently, because these tasks are done in a timelier manner and materials are saved.
- The partial renovation of plants based on their knowledge and often outside of the typical scope of recommendations from technicians; such is the case of many small coffee growers in Colombia.
- Savings in tools, machinery and infrastructure costs because they do not use them or sometimes buy them second hand. They have lower animal costs, which can be illustrated with a specific example: in many cases, as in Ubaté and Antioquia (Table 8), the yields of the small producers are lower, but their costs are also significantly lower because they buy animals at a much cheaper rate and do not use expensive machinery (mechanical milking).

But, as we have shown in several works (Forero, 2010, 2011 & 2012) what is most important in obtaining micro-scale economies is the plasticity and adaptability that the family production system has to face changes in climatic and market conditions, due to its ability to combine its monetary scope (product sales, purchasing supplies, hiring labor, access to credit ...) with its non-monetary scope (self-consumption, exchanging products and supplies ...) in a complementary or "mutualistic" way.

As in the cases presented in the previous section, the farmers analyzed in this chapter sell their products on the open market; milk producers who are integrated through somewhat stable contracts with the dairy chain and some palm fruit producers who sell to oil companies are excluded. Thus, we have additional evidence to support what has been said about the advantages of the informal food marketing system (Table 11).

**Table 11**
**Colombia: Market types and agents that buy products in some regions, in 2005 and 2012**

| Year | Region | Main Product | Agents That Buy The Product | Type of Market |
|---|---|---|---|---|
| 2005 | Norte de Antioquia | Milk | Manufacturers | Closed |
| | Ubaté and Chiquinquirá | Milk | | |
| | Cesar | Dual-purpose livestock | | |
| | San Luis, Tolima | Corn and sorghum | Intermediaries | Open with regulatory legislation |
| | Cereté , Córdoba | Corn and cotton | | |
| | Altillanura | Corn and soy | Agricultural industry | Closed |
| 2012 | Bélen de Umbria - Risaralda | Coffee | Cooperative of coffee growers | Open with buyers guarantee |
| | Ciudad bolivar - Antioquia | | Private buyers | |
| | Quimbaya - Quindío | Plantains | Wholesalers | Open |
| | Fuente de Oro - Meta | | Local & wholesale markets | |
| | Cabuyaro - Meta | Mechanized rice | Mills | Open |
| | Majagual - Sucre | | | |
| | María la Baja - Bolivar | Modified corn | Wholesalers and local buyers | Open |
| | Granada - Meta | Potatoes | Local markets, large city wholesalers | Open |
| | Choconta - Cundinamarca | | | |
| | Ipiales - Nariño | | | |
| | Saba de Torres - Santander | Palm | Palm groups | Open - Closed |
| | El Retén - Magdalena | | Intermediary buyers who sell to palm groups | |

Source: Forero *et* al., 2007; Forero *et* al., 2013.

Plantains, corn, and potatoes are mostly sold in the wholesale market in the large nearby cities —Corabastos in Bogotá; Central de Abastos de Cali, Cavasa; Central de Abastos de Pasto El Potrerillo and markets in Barranquilla, Sincelejo, Cartagena— and to a lesser extent in local markets; rice is sold to local mills; coffee is sold especially to coffee growers' cooperatives and some individuals, while palm is sold to extraction plants in each of the palm growing regions.

## 4. Conclusions

Although there is no representative data strictly pertaining to the entire country, the fact that the numerous cases studied obtain similar results provides us with reason to argue that we have made significant progress in showing that family farmers are efficient, given the work used in their farming systems. Their production is paid well above its opportunity cost. We have, on one hand, a broad set of cases that give similar results in this regard, which is very solid evidence to setting trends. On the other hand, we have results of a highly representative survey - twelve statistically representative samples in randomly selected regions – in regions with highly productive dynamism, which tends to solidly confirm the idea that under favorable conditions, family farming is as efficient as their business counterparts, both on the medium and large scales.

The income contributed to rural households by family farming production systems - family surplus from net production - is above the poverty lines in most cases (61% when taking into account the current poverty line and 49% when compared to the previous poverty line).[18] These data account for the viability of family farming and its possibilities of generating income, so the reason why the production systems do not produce surpluses above the poverty level is related to limited access to land and capital, which is a circumstance that prevents family farmers from expanding these systems in order to provide the necessary income to satisfy family needs on their own accord. It should also be considered that households generally have other sources of income that, when they correspond to local jobs, are paid a lesser amount than those obtained within their own production systems.

These conclusions would refute the data obtained by household surveys, which show that in rural households agricultural income – produced by the family's themselves - is compensated at a rate well below the minimum wage and therefore access to land is not a good strategy when attempting to lift the rural population out of poverty. We have argued in this regard that said surveys undervalue this income, therefore it is necessary to adjust the methodologies used to accurately portray it.

The fact that family producers are successful in open markets clearly indicates that their economic viability does not depend on whether they join chains (or alliances) under contracts with large trading companies - supermarkets and hypermarkets - or processing companies, nor corporate markets (State agency purchases), although we would be remiss to deny what we have shown above, namely, that in many cases these options are advantageous.

[18] These data correspond to those in Figure 1 and show that 39% of cases are below the current poverty line and 51% are below the previous poverty line.

When family producers have access to relatively optimal conditions, their efficiency is very high and similar to that of medium and large-scale businesses, this demonstrates that, within the Colombian context, the high efficiency of family farming is not determined by low productive development, rather, this production system has its own advantages (which we have coined scale microeconomies). This conclusion, based on an investigative strategy with good statistical representativeness (twelve randomly selected regions and representative samples in each region with low sampling error), allows us to safely state and reflect that a valid agriculture model for the country should not lead to prioritizing family or agribusiness on a large scale, but rather should define a strategy that includes various types of production.

In the latest diagnostic report on Colombian rural regions, the *Misión para la Transformación del Campo* (Mission for the Transformation in Rural Regions in English)-MTC states that small production, in addition to generating social benefits, is more productive. However, it also indicates that in Colombia there are no reliable data disaggregated based on property size (MTC, 2015). It seems to us that the information presented in this study contributes significantly to filling this gap.

## Public Policy Recommendations

It is clear that, given the economic efficiency of family farmers, policy should be aimed at improving their productive conditions, which could include some interest rate subsidies (to production) and *Incentivos a la Capitalización Rural* (ICR, or Rural Capitalization Incentives in English - RCI). It is obvious that public goods must be strengthened and the family farmers' access to irrigation, machinery banks, road infrastructure and agricultural technical assistance should be made viable, but it also must be considered that in Colombia, agricultural subsidies, from the middle of the 20th century until now, form a structural situation as seen in industrialized countries, which cannot be simply dismantled overnight with the theoretical argument that the right thing to do is to invest in public goods.

Although the growing participation of small producers in regard to credit over the last two decades is noteworthy, it is lesser than what was experienced in the eighties, when they received a little more than 40% of the allocation of official resources (Forero, 2012). Nowadays this participation is around 25%. While this seems like a negative trend, small producers now have had access to the RCI (Annexes 9 & 10).

The country lost a long history of positive interaction between public institutions and farmers when the institution Caja Agraria converted into the Banco Agrario. Today, part of what has

been lost has been recovered, but it seems that we are still far from a situation in which the types of subsidies and credit offers and the strategies to allocate them are sufficiently flexible and adaptable to the general and local needs of family farmers. When considering that some non-profit private entities have had successful experiences with alternatives such as revolving funds, it is recommended to take these experiences into account in order to adjust the means of interactions with producers.

Regarding the allocation of land, clear goals must be drawn up and implemented to improve the access of farmers and family farmers to this asset, so that they can further develop their productive potential. Although it is true that almost all governments have increased resources for the allocation of land, the results are far from what was planned and a large part of the cultivable area is monopolized by extensive livestock farming, while family farmers are reduced and limited to small plots that restrict their productive potential (Forero, 2012). The project named *Ley de Tierras y Desarrollo Rural* (Laws on Land and Rural Development in English), which was drafted by a group of experts during President Santos' first administration - has not been presented to Congress because it has not passed the previous consultation - proposes a profound adjustment in the mechanisms for assigning properties that would lead to a redistribution of unused and semi-productive land —in extensive cattle ranching— according to its productive potential.

It is not enough to expand the coverage of successful programs (alliances, opportunities, *Red de Seguridad Alimentaria* – ReSA (Food Security Network in English), etc.), but also adjustments - profound in some cases - must be made so that synergies are achieved, and investments are fruitful. Although it is important to note that the *programas de desarrollo rural integral con enfoque territorial* (PDRIET, integrated rural development programs with a territorial approach in English) that are being implemented would begin to solve the problems previous mentioned. This initiative is still in its infancy.

It is also important, in our opinion, not to exclude from public policy, as is done in practice, the production that circulates through the open market, since this commercialization system massively places family production in consumption centers and evidence has shown that it has the great advantage of selling food to working class households at much lower prices than found in the formal system. The current price information system only provides information regarding the sale price of wholesalers in supply centers and large markets, and the aggregate consumer price per city. Consequently, it seems essential to us to set up a complete price information system that gives clear indicators of producer prices in different rural regions, consumer prices in urban locations, and by type of agent. The fact is that, public policy on this matter is poorly designed (see Forero, 2006).

If we look back, the *Fondo de Desarrollo Rural Integrado* (DRI, Integrated Rural Development Fund in English), the *Plan Nacional de Rehabilitación* (PNR, National Rehabilitation Plan in English), and the *Programa Nacional de Transferencia de Tecnología Agropecuaria* (Pronatta, National Program for the Transfer of Agricultural Technology in English) were interesting and efficient alternatives for the implementation of public policies in productive development and rural

development in general. The dismantling of such programs has been very costly for the country and it is important to remember the lessons learned from these experiences to guide future public policy. Contrarily, the producer support system from the *Federación de Cafeteros* (Federation of Coffee Growers in English) has been so efficient that it has made the coffee farmer privileged in the context of both Colombian farming and the world coffee industry as a whole. This experience, which contrasts sharply with the scope of government programs, must be analyzed in great detail and care: The Federation system is democratic and inclusive in the allocation of resources because it reaches almost all coffee growers, who represent at least 25% of Colombian farmers (Forero, 2010a).

Agricultural technical assistance should: i) continue to strengthen the Technical Assistance Subsystem with clear responsibilities at the central and territorial level and with the leadership of the *Ministerio de Agricultura y Desarrollo Rural* (MADR, Ministry of Agriculture and Rural Development in English); in this sense the important contribution of resources by the MADR through the program *Desarrollo Rural con Equidad* (DRE, Rural Development with Equity in English) from 2011 to 2014 is highlighted; ii) coordinate efforts between MADR programs and affiliated/related entities that provide these assistance services, along with other national, territorial and international cooperation entities; iii) provide guidelines and implement mechanisms to verify the quality and suitability with which technical assistance services are provided.

In conclusion, we reiterate that public policy must be decisively directed at supporting family farming, not only as a strategy of social justice or aimed at retaining this portion of the population, which in itself would be valid, but above all because its trajectory and its potential clearly show that strengthening this sector is a logical strategy for the eradication of poverty and rural development.

## References

## Annexes

### Annex 1

**Table A1**
**Types of methodology in the case studies collected per region**

| Year | Region | Survey | Indirect Census | Typical Case | Farm Case Studies | Source |
|---|---|---|---|---|---|---|
| 2013 | Altilanura . Puerto López - Meta | | | | 10 | Forero, *et* al. (2015) |
| 2002 | Cajamarca (Cuenca Anaime) - Tolima | | | X | | Forero, *et* al. (2003) |
| 1997 - 2002 | Hoya del Río Suárez | | | X | 3 | |
| 1999 - 2002 | Villapinzón - Cundinamarca | | | X | 3 | |
| 1999 - 2002 | Une - Cundinamarca | | | X | 3 | |
| 2002 - 2003 | Granada - Cundinamarca | | | X | 3 | |
| 1991 - 2002 | Riosucio - Supia - Caldas | 76 | | | 76 | Forero, *et* al. (2004) |
| | Curití - Santander | 10 | | | 10 | |
| | Cajamarca (Cuenca Anaime) – Tolima | 7 | | | 7 | |
| 1990 - 2000 | Guane in Barichara – Santander | 18 | X | X | | Forero, *et* al. (2002) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Fómeque – Cundinamarca | 23 | X | X | | |
| 1998 - 1999 | Cuenca Combeima , Ibagué – Tolima | | X | X | | Forero, *et* al. (2000) |
| 1998 - 1999 | Cuenca alta del Río de Oro, Piedecuesta - Santander | | X | X | | |
| 1998 | Lenguazaque - Cundinamarca | | X | X | 5 | |
| 1998 | Chachaguí and Buesaco Nariño | | | X | | Paz, (1999) |
| 1998 | Cuenca alta del Rio Gudalajara in Buga - Valle del Cauca | | | X | 5 | Forero, *et* al. (2000) |
| 1995 | Viotá - Cundinamarca | | | X | | Amaya, (1998) |
| 1991 | Restrepo - Valle del Cauca | | | X | | Forero, *et* al. (1999) |
| 2009 - 2010 | Mitú - Vaupés | | X | | 4 | Cuellar, (2010) |

Source: Data collected by the authors.

**Annex 2**

**Table A2**
**Economic indicators of family production systems, formulas and definitions**

| Indicator | Formula | Definition |
|---|---|---|
| Agricultural family income (AFI) | AFI = MI + DI | The sum of the monetary and domestic income that are earned by the family as a result of agricultural activities. The monetary income is the result of selling products, and the domestic incomes are the products consumed by the family. |

| | | |
|---|---|---|
| Family technical production surplus (FTPS) | FTPS = AFI - MC | The difference between agricultural family income and monetary costs. This surplus is what is left over as compensation, after subtracting monetary expenses if they do not pay rent. It is an indicator of the system's capacity to generate income for the producer. |
| Net family production surplus (NFPS) | NFPS= FTPS - PR | The income that is truly left for the family, after the transferring part of the surplus generated by the system for the people that invested productive resources, such as land or money. |
| Technical compensation per domestic workday (TCDWD) | TCDWD = FTPS/DW | The relationship between the technical surplus of the productive system and the daily domestic wage. It expresses the capacity of income generation within the productive system, in other words, it is what the system will be actually compensated for in terms of a daily domestic wage. This indicator, when compared with the market daily wage (opportunity cost), shows whether the agricultural activity is more or less remunerative for the family compared to other alternatives. |
| Net compensation per domestic workday (NCDWD) | NCDWD = NFPS/DW | The relationship between the net surplus of the productive system, that is actually left for the family, and daily domestic wages. It indicates the actual income that is left for the family per workday within their productive system. |
| Technical profitability | TP = IM+ID-CT / CT | The indicator that shows economic efficiency of the productive systems. It shows the relationship between the supplies (costs) and the products (income), to represent the cost-benefit relation of the productive systems. This indicator corresponds to the technical efficiency of the system before distributing the surplus with other economic agents that contributed with either land and/or capital. |
| Net profitability | NP=MI+DI-CT-PR / CT+PR | Shows the economic efficiency of the system after deducting the rents paid to those who had contributed with land and/or capital. |
| % Monetary income | %MI = MI *100 / MI +DI | The relationship between the monetary income (sales) and the total income (sales and family consumption of products). It indicates the percentage of production that is destined for sale and that is converted into monetary income for the family. |
| % Monetary costs | % MC = MC*100 / MC +DC | The relationship between the monetary costs and the total costs (including domestic costs). It indicates what percentage of total invested costs is in paid in money. |
| % Daily paid wages | %DP = DP*100 / DP +DW | The relationship between daily wages paid and total daily wages. It indicates what percentage of the total wages invested in production is from hired wages. |

Source: Authors' elaboration.

## Annex 3

**Table A3**
**Variables used to calculate the economic indicators of family production systems, variables and definitions**

| Variables | Definition |
|---|---|
| MI = Monetary Income | The sum of the quantities sold for their respective price to the producer. |
| DI = Domestic Income | The sum of the quantities consumed by the family or donated by theirrespective consumer price . |
| MC = Monetary Cost | The costs that the producer paid in money to start the production system. For example: daily wages paid, supplies, machinery, etc. |
| DC = Domestic Cost | The costs that the families assume to carry out their daily activities on the land without incurring in any monetary payments. For example: daily domestic wages, organic fertilizer, etc. |
| PR = Paid rent | Payments that the producer has to make for access to land when it is not his/her property or for access to sources of funding. |
| DW = Domestic Daily Wages | The amount of daily wages invested by the family in the agricultural activity. |
| DP = Daily Paid Wages | The number of daily wages that are paid by the family |

Source: Terms created by the authors.

## Annex 4

**Table A4**
**Colombia: Family technical production surplus and net family production surplus in family production systems in relation to the current poverty line according to main agricultural activity, cases studied from 1990 to 2013**

| Family technical production surplus / Current poverty line | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ranges in number of poverty lines | Coffee[a] | Potatoes | Fruits and vegetables[b] | Panela | Bovine livestock[c] | Diverse[d] | Total | |
| <1 time | 4 | 1 | 3 | 0 | 1 | 8 | 17 | 27.9% |
| >1 <= 2 times | 4 | 2 | 5 | 1 | 1 | 0 | 13 | 21.3% |
| >2 and <= 4 times | 6 | 2 | 3 | 1 | 2 | 2 | 16 | 26.2% |
| > 4 and <= 6 times | 1 | 5 | 2 | 0 | 2 | 0 | 10 | 16.4% |
| > 6 times | 1 | 3 | 0 | 0 | 0 | 1 | 5 | 8.2% |
| Total cases | 16 | 13 | 13 | 2 | 6 | 11 | 61 | |
| | | | | | | | | |
| **Net family production surplus / Current poverty line** | | | | | | | | |
| <1 time | 5 | 2 | 6 | 1 | 2 | 8 | 24 | 39.3% |
| >1 <= 2 times | 4 | 2 | 3 | 0 | 0 | 1 | 10 | 16.4% |
| >2 and <= 4 times | 5 | 3 | 2 | 1 | 2 | 1 | 14 | 23.0% |
| > 4 and <= 6 times | 1 | 3 | 2 | 0 | 2 | 0 | 8 | 13.1% |
| > 6 times | 1 | 3 | 0 | 0 | 0 | 1 | 5 | 8.2% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total cases | 16 | 13 | 13 | 2 | 6 | 11 | 61 | |

[a] Coffee & livestock
[b] Blackberries, cape gooseberries, tomatoes and other vegetables
[c] Livestock & milk
[d] Diverse: tobacco, corn, beans, fique, cattle, cassava, pigs, poultry, eggs, cocoa, fruit, sesame, pineapple, dairy products.
Sources: Forero, 1999; Forero *et al*., 2000; Forero *et al*., 2002; Forero *et al*., 2003; Forero *et al*., 2004; Paz, 1999; Amaya, 1998, Forero *et al*., 2015; Cuéllar, 2010.

## Annex 5

**Table A5**
**Family technical production surplus and net family production surplus in family production systems in relation to the previous poverty line according to main agricultural activity, cases studied from 1990 to 2013**

| **Family technical production surplus / Previous poverty line** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Ranges in number of poverty lines** | **Coffee[a]** | **Potatoes** | **Fruits and vegetables[b]** | **Panela** | **Bovine Livestock[c]** | **Diverse** | **Total** | |
| <1 time | 7 | 3 | 8 | 1 | 2 | 8 | 29 | 47.5% |
| >1 <= 2 times | 5 | 2 | 2 | 1 | 1 | 2 | 13 | 21.3% |
| >2 and <= 4 times | 3 | 5 | 3 | 0 | 3 | 1 | 15 | 24.6% |
| > 4 and <= 6 times | 1 | 3 | 0 | 0 | 0 | 0 | 4 | 6.6% |
| > 6 times | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0% |
| Total cases | 16 | 13 | 13 | 2 | 6 | 11 | 61 | |
| | | | | | | | | |
| **Net family production surplus / Previous poverty line** | | | | | | | | |
| <1 time | 8 | 3 | 9 | 1 | 2 | 8 | 31 | 50.8% |
| >1 <= 2 times | 5 | 4 | 1 | 1 | 1 | 2 | 14 | 23.0% |
| >2 and <= 4 times | 2 | 3 | 3 | 0 | 3 | 1 | 12 | 19.7% |
| > 4 and <= 6 times | 1 | 3 | 0 | 0 | 0 | 0 | 4 | 6.6% |
| > 6 times | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% |
| Total cases | 16 | 13 | 13 | 2 | 6 | 11 | 61 | |

[a] Coffee & livestock
[b] Blackberries, cape gooseberries, tomatoes and other vegetables
[c] Livestock & milk
[d] Diverse: tobacco, corn, beans, fique, cattle, cassava, pigs, poultry, eggs, cocoa, fruit, sesame, pineapple, dairy products.
Sources: Forero, 1999; Forero *et al*., 2000; Forero *et al*., 2002; Forero *et al*., 2003; Forero *et al*., 2004; Paz, 1999; Amaya, 1998, Forero *et al*., 2015; Cuéllar, 2010.

## Annex 6

**Table A6**
**Colombia: Daily technical and net compensation for domestic work in family production systems in relation to ordinary minimum wages according to main agricultural activity, cases studied from 1990 to 2013**

| **Technical Compensation Per Domestic Wage / Ordinary Minimum Wage** |
|---|

| Ranges in number of daily minimum wage | Coffee[a] | Potatoes | Fruits and vegetables[b] | Bovine livestock[c] | Diverse[d] | Total | |
|---|---|---|---|---|---|---|---|
| <1 minimum wage | 0 | 0 | 0 | 0 | 1 | 1 | 2.5% |
| >1 <= 2 minimum wages | 2 | 0 | 2 | 0 | 6 | 10 | 25.0% |
| >2 <= 3 minimum wages | 1 | 0 | 0 | 0 | 1 | 2 | 5.0% |
| > 3 <= 5 minimum wages | 2 | 2 | 1 | 0 | 3 | 8 | 20.0% |
| > 5 minimum wages | 8 | 3 | 6 | 2 | 0 | 19 | 47.5% |
| Total cases | 13 | 5 | 9 | 2 | 11 | 40 | |
| | | | | | | | |
| **Net Compensation Per Domestic Daily Wage / Ordinary Minimum Wage** | | | | | | | |
| <1 minimum wage | 1 | 0 | 1 | 0 | 3 | 5 | 12.8% |
| >1 <= 2 minimum wages | 2 | 0 | 1 | 0 | 4 | 7 | 17.9% |
| >2 <= 3 minimum wages | 0 | 0 | 2 | 0 | 2 | 4 | 10.3% |
| > 3 <= 5 minimum wages | 4 | 2 | 1 | 0 | 2 | 9 | 23.1% |
| > 5 minimum wages | 6 | 3 | 4 | 1 | 0 | 14 | 35.9% |
| Total cases | 13 | 5 | 9 | 1 | 11 | 39 | |

[a] Coffee & livestock
[b] Blackberries, cape gooseberries, tomatoes and other vegetables
[c] Livestock & milk
[d] Diverse: tobacco, corn, beans, fique, cattle, cassava, pigs, poultry, eggs, cocoa, fruit, sesame, pineapple, dairy products.
Sources: Forero, 1999; Forero *et al*., 2000; Forero *et al*., 2002; Forero *et al*., 2003; Forero *et al*., 2004; Paz, 1999; Amaya, 1998, Forero *et al*., 2015; Cuéllar, 2010.

## Annex 7

### Table A7
### Colombia: Daily technical and net compensation of domestic work in family production systems in relation to full minimum wages according to main agricultural activity, cases studied from 1990 to 2013

| **Technical Compensation Per Domestic Daily Wage / Full Minimum Wage** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ranges in number of daily minimum wage | Coffee[a] | Potatoes | Fruits and vegetables[b] | Bovine livestock[c] | Diverse[d] | Total | |
| <1 minimum wage | 2 | 0 | 2 | 0 | 8 | 12 | 30.0% |
| >1 <= 2 minimum wages | 1 | 1 | 0 | 0 | 3 | 5 | 12.5% |
| >2 <= 3 minimum wages | 6 | 2 | 7 | 0 | 0 | 15 | 37.5% |
| > 3 <= 5 minimum wages | 1 | 1 | 0 | 0 | 0 | 2 | 5.0% |
| > 5 minimum wages | 3 | 1 | 0 | 2 | 0 | 6 | 15.0% |
| Total cases | 13 | 5 | 9 | 2 | 11 | 40 | |
| | | | | | | | |
| **Net Compensation Per Domestic Daily Wage / Full Minimum Wage** | | | | | | | |
| <1 minimum wage | 3 | 0 | 2 | 0 | 8 | 13 | 33.3% |
| >1 <= 2 minimum wages | 0 | 1 | 2 | 0 | 3 | 6 | 15.4% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| >2 <= 3 minimum wages | 7 | 2 | 5 | 0 | 0 | 14 | 35.9% |
| > 3 <= 5 minimum wages | 0 | 1 | 0 | 0 | 0 | 1 | 2.6% |
| > 5 minimum wages | 3 | 1 | 0 | 1 | 0 | 5 | 12.8% |
| Total cases | 13 | 5 | 9 | 1 | 11 | 39 | |

[a] Coffee & livestock
[b] Blackberries, cape gooseberries, tomatoes and other vegetables
[c] Livestock & milk
[d] Diverse: tobacco, corn, beans, fique, cattle, cassava, pigs, poultry, eggs, cocoa, fruit, sesame, pineapple, dairy products.
Sources: Forero, 1999; Forero *et al*., 2000; Forero *et al*., 2002; Forero *et al*., 2003; Forero *et al*., 2004; Paz, 1999; Amaya, 1998, Forero *et al*., 2015; Cuéllar, 2010.

## Annex 8

### Table A8
### Net profitability of the production system by region and crop, conventional method and Boopstrap method

| | | **Net Profitability Of The Productive System. Conventional Method** | | | | | **Net Profitability Of The Productive System. Boopstrap Method. Estimations For Most Probable Values** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product | Region | Size | | | Average differences | Total | Size | | | Average differences[1] | Total |
| | | L | M | S | | | L | M | S | | |
| Coffee | Belén de Umbría | 56% | 54% | 28% | *MP | 38% | 52% | 41% | 22% | *** GP MP | 28% |
| | | 0% | 17% | 19% | | 12% | 9% | 14% | 9% | | 9% |
| | Ciudad Bolívar | 43% | 45% | 52% | | 48% | 44% | 40% | 41% | | 41% |
| | | 7% | 15% | 15% | | 8% | 7% | 8% | 3% | | 7% |
| Rice | Cabuyaro | 17% | 34% | 52% | *CP | 39% | 26% | 24% | 54% | *** GP MP | 34% |
| | | 0% | 15% | 7% | | 10% | 7% | 4% | 2% | | 9% |
| | Majagual | 26% | 26% | 42% | | 42% | 26% | 48% | 41% | | 42% |
| | | | 17% | 6% | | 6% | 0% | 7% | 27% | | 7% |
| Potatoes | Chocontá | 65% | 65% | 82% | | 82% | 56% | 82% | 84% | ** GM **GP | 83% |
| | | 0% | 11% | 5% | | 4% | 13% | 11% | 6% | | 4% |
| | Ipiales | 1% | 1% | 21% | | 10% | -8% | -17% | 13% | *** MP | -2% |
| | | -69% | -188% | 30% | | 36% | 60% | 11% | 3% | | 36% |
| Platains | Fuentes de Oro | 88% | 88% | 105% | | 104% | 78% | 75% | 105% | *** GP MP | 103% |
| | | | 13% | 3% | | 2% | 9% | 8% | 7% | | 3% |
| | Quimbaya | 55% | 55% | 22% | | 25% | 57% | 27% | 2% | *** GP MP GM | 7% |
| | | 0% | 27% | 15% | | 13% | 17% | 25% | 20% | | 18% |
| Corn | María la Baja | | 94% | 22% | **MP | 24% | | 85% | 10% | * MP | 12% |
| | | | 161% | 18% | | 17% | | 19% | 40% | | 19% |
| | Granada | 52% | 40% | 38% | | 40% | 40% | 41% | 36% | | 38% |
| | | 13% | 15% | 10% | | 8% | 0% | 14% | 11% | | 12% |
| National Total | | 48% | 48% | 52% | | 51% | 37% | 37% | 45% | | 42% |
| | | 3% | 7% | 3% | | 2% | 13% | 11% | 5% | | 4% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Palm | Sabana de Torres | 76% | -5% | 7% | ***MG ***PG | 12% | |
| | | 0% | 161% | 118% | | 58% | |
| | El Retén | 212% | 181% | 124% | **PG **MP | 141% | |
| | | 0% | 10% | 6% | | 6% | |

[1]GM significant differences between large and medium producers. GP significant differences between large and small. MP significant differences between medium and small. *** at 1% (extremely high probability of finding differences) ** at 5% (very high) * at 10% (high). Coefficient of variation (CV) in italics.
Source: Forero *et al.* (2013).

**Annex 9**

**Table A9**
**Colombia: Behavior of the Finagro credit, 2002-2013 (Colombian pesos)**

| Year | Total Number Of Loans | Number Of Loans For Small Producers | % | Number Of Loans For Other Producers | % | Loan Value | Medium And Large Producers | % | Small Producers | % |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 44,422 | 27,371 | 61.6% | 17,051 | 38.4% | $1,053,243 | $ 866,515 | 82.3% | $186,728 | 17.7% |
| 2003 | 67,870 | 47,861 | 70.5% | 20,009 | 29,5% | $ 1,559,636 | $1,333,231 | 85.5% | $226,405 | 14.5% |
| 2004 | 112,831 | 90,858 | 80.5% | 21,973 | 19,5% | $ 1,892,077 | $1,478,395 | 78.1% | $413,682 | 21.9% |
| 2005 | 162,024 | 136,317 | 84.1% | 25,707 | 15,9% | $ 2,207,855 | $1,566,955 | 71.0% | $640,900 | 29.0% |
| 2006 | 173,567 | 144,350 | 83.2% | 29,217 | 16,8% | $ 2,375,400 | $1,764,299 | 74.3% | $611,102 | 25.7% |
| 2007 | 174,740 | 138,597 | 79.3% | 36,143 | 20.7% | $ 3,073,120 | $2,448,702 | 79.7% | $624,417 | 20.3% |
| 2008 | 182,610 | 137,826 | 75.5% | 44,784 | 24.5% | $ 3,805,400 | $3,134,427 | 82.4% | $670,973 | 17.6% |
| 2009 | 190,209 | 161,456 | 84.9% | 28,753 | 15.1% | $ 4,127,480 | $3,262,826 | 79.1% | $864,654 | 20.9% |
| 2010 | 249,908 | 214,641 | 85.9% | 35,267 | 14.1% | $ 4,445,219 | $3,285,994 | 73.9% | $1,159,225 | 26.1% |
| 2011 | 274,944 | 239,009 | 86.9% | 35,935 | 13.1% | $ 5,473,100 | $3,995,513 | 73.0% | $1,477,587 | 27.0% |
| 2012 | 267,358 | 232,275 | 86.9% | 35,083 | 13.1% | $ 6,472,143 | $4,826,282 | 74.6% | $1,645,871 | 25.4% |
| 2013 | 278,000 | 245,000 | 88.1% | 33,000 | 11.9% | $ 7,000,000 | $5,200,000 | 74.3% | $1,800,000 | 25.7% |

Source: MADR management reports & Finagro.

**Annex 10**

**Table A10**
**Colombia: Behavior of the incentive to rural capitalization. Finagro, 2006-2013. (Colombian Pesos)**

| Year | Type of Producer | Applications | Project Value | IRC Paid | % IRC Paid |
|---|---|---|---|---|---|
| 2006 | Associated | 9 | | $9,618 | 23.6% |
| | Small | 6,628 | | $11,248 | 27.6% |
| | Other | 1,179 | | $19,887 | 48.8% |
| | Total | 7,816 | $197,260 | $40,753 | |
| 2007 | Associated | 8 | $22,783 | $ 9,016 | 17.3% |

| | | | | | |
|---|---|---|---|---|---|
| | Small | 6,795 | $57,765 | $14,269 | 27.4% |
| | Other | 1,775 | $189,288 | $28,729 | 55.2% |
| | Total | 8,578 | $269,836 | $52,014 | 100.0% |
| 2008 | Associated | 10 | $9,016 | $9,924 | 9.8% |
| | Small | 7,871 | $14,269 | $17,585 | 17.4% |
| | Other | 4,463 | $28,729 | $73,679 | 72.8% |
| | Total | 12,344 | $52,014 | $101,188 | 100.0% |
| 2009 | Associated | 15 | $54,030 | $19,146 | 9.3% |
| | Small | 38,125 | $236,032 | $87,149 | 42.2% |
| | Other | 4,475 | $641,610 | $100,059 | 48.5% |
| | Total | 42,615 | $931,672 | $206,351 | 100.0% |
| 2010 | Associated | 15 | $54,030 | $19,146 | 9.3% |
| | Small | 38,125 | $236,032 | $87,156 | 42.2% |
| | Other | 4,475 | $641,610 | $100,059 | 48.5% |
| | Total | 42,615 | $931,672 | $206,361 | 100.0% |
| 2011 | Associated | 8 | $16,337 | $7,449 | 6.7% |
| | Small | 72,419 | $455,563 | $68,024 | 60.8% |
| | Other | 1,329 | $210,484 | $36,448 | 32.6% |
| | Total | 73,756 | $682,384 | $111,921 | 100.0% |
| 2012 | Associated | 6 | $24,329 | $9,545 | 3.6% |
| | Small | 69,850 | $531,071 | $192,161 | 73.2% |
| | Other | 2,997 | $365,313 | $60,796 | 23.2% |
| | Total | 72,853 | $920,713 | $262,502 | 100.0% |
| 2013 | Associated | 5 | $1,939 | $666 | 0.2% |
| | Small | 3,044 | $274,060 | $68,756 | 22.2% |
| | Other | 72,032 | $536,918 | $240,516 | 77.0% |
| | Total | 75,081 | $1,139,463 | $309,938 | 100.0% |

Source: MADR management reports & Finagro