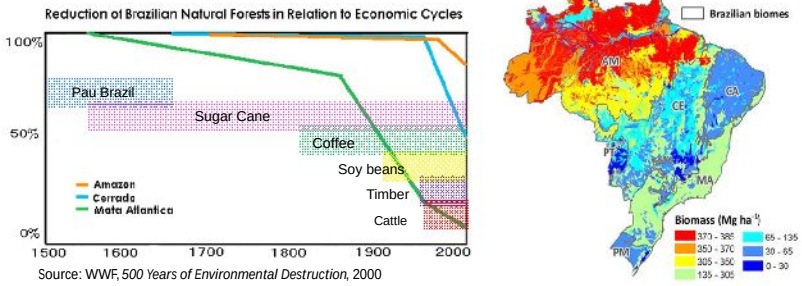
# Forest Policies in Brazil and Tree crop cultivation by illegal small farmers in Lower Amazon

Kanae Ishimaru

1. Current situation and Basic Forest Policies in Brazil

## 1.1 History of Brazilian Forest biomass change



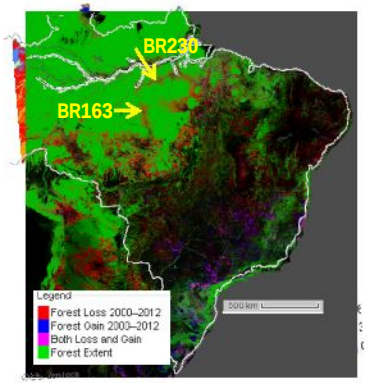

Source: WWF, *500 Years of Environmental Destruction*, 2000



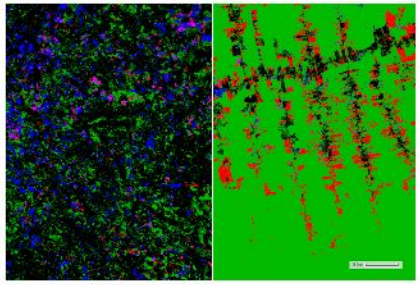

| | |
|---|---|
| 1500s | Pau Brazil (red dye) export started after discovery of Brazil by P.A. Cabral. |
| 1530 | First immigrants from Portugal moved to Brazil. |
| Mid 16C | Mata Atlantica development started for sugar cane plantation. |
| Early 19C | MA Development accelerated of coffee plantation at southern part. |
| Late 19C | Soy bean plantation gave fatal impact on MA. |
| 1940s | Programs for Amazon development are set by president G. Vargas. |
| 1965 | Amazon development led by military regime became widespread. |

## 1.2 Recent Forest Biomass change

Though drastic decrease in annual forest loss in last 5 years is reported, forest loss is still ongoing at Amazon Area. On the other hand, Southern part including Mata Atlantica region showed forest gain to some extent.




Source: *Global Forest Change*, Department of Geographic Science University of Maryland



Left: Hill slopes at Mata Atlantica in Minas Gerais State. Right: Along Amazon Highway BR 130 in Para State

## 1.3 Forest related regulations and policies

- By the Forest code (Law project 1.876/99)enacted in 1965, land owners must maintain 80% and 20% of forest as legal reserves in Amazon area and Mata Atlantica, respectively.
- Demands to forest code reform, especially withdrawal of 80% development restriction in Amazon had declined in 2012.
- "The Action Plan for Prevention and Control of the Legal Amazon Deforestation" (PPCDAm ) which enacted in 2004 includes about 200 projects by 13 ministries and satellite monitoring to prevent forest loss in Brazil especially Amazon.
- Due to this action plan, Brazil has reduced 84% of forest loss area in last 8 years.

## 1.4 Development in Amazon region

1940s President G. Vargas declared to conquest interior frontiers of Amazon.

1965 Amazon development led by military regime became widespread.

1970 National integration plan (PIN: Plano de Integração Nacional) was executed.
- Tax incentives (25-50% discount) provided by SUDAM (Superintendência do Desenvolvimento da Amazônia) accelated forest development for large cattle ranch
- Long highway roads paved across amazon area and to southward had driven deforestation in Amazon during 1970s.

1980s
- North pole project (projeto PORONOROESTE) were executed
  - ➢to contribute to the largest national integration
  - ➢to promote the demographic occupation of the northeastern region of Brazil
  - ➢to increase the region's production and the population's earned revenue
  - ➢to reduce intra- and inter-regional disparities
- Extensive Amazon development accompanied by foreign capitals.

2000s Increasing needs for beef and bioethanol drived large-scale development in Amazon.

## 1.5 Organizations related to Forest Development and conservation

- **環境省**（Ministério do Meio Ambiente：MMA)
  Examination and permission of forest development plans
  - **環境・再生可能天然資源院**（Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis：IBAMA）
  - **ブラジル森林局**（Serviço Florestal Brasileiro：SFB）
- **農務供給省** (Ministério da Agricultura e Abasatcimento : MAPA)
  National policy planning for agriculture and farming, Agribuisiness promotion
- **農業開発省** (Ministério do Desenvolvimento Agrária：MDA)
  Family agriculture support, agrarian reform promotion, sustainable agricuture
  - **農地改革院**（Instituto Nacional de Colonizaçãoe Reforma Agrária ：INCRA）
- **アマゾン開発庁** SUDAM; Superintendênsia do Desenvolvimento de Amazonia
- PNRA; Plano National Reforma Agrária
- POEMA; Pobreza e Meio Ambiente na Amazônia.

## 1.6 Support programmes for small farmers

Annual budget for Ministry of Agriculture Development (Ministério do Desenvolvimento Agrária : MDA) has increased to 3 times in 7 years under the Lula administration which the support base is workers' party **７年間で約三倍の**27**億ドルに**

Rural development policies by MDA
- Low -interest loan (Programma Nacional de Fortalecement da Agriultura Familiar PRONAF)
- Technical assistance and information providing (Assistência Técnica e Extenção Rural Ater)
- Insurance for family agriculture (Seguro da Agricultura Familiar PGPAF)
- Job assistance for women, youth and black peoples.
- Etc.

Definition of family farming are farmers
- Fcultivated area less than 4 times of average cultivated area
- Main labor force is family members
- More than 80% of incomes gained from agricutural production.

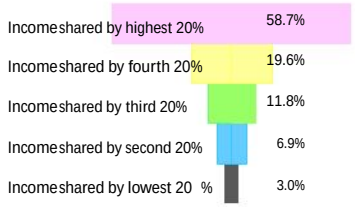
# 2. Tree crop cultivation of small farmers in Amazon

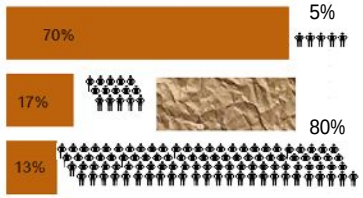
## 2.1 Social back ground of landless peasants' movement

Since 1980s, the illegal small farmers squatting into abandoned secondary forest, called "invasão", became a problematic that their unsustainable land use are inducing repeated small-scaled deforestation and land degradation.

Brazil has one of the worst wealth gap in the world. World bank 2003 has reported inequality is not only high among the world but also persistent over time.

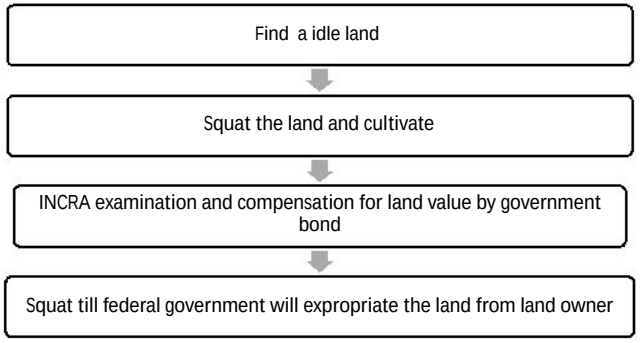
- Top 5% of landowners control about at least 70% of arable land and nearly half of the farm land is idle.
- Bottom 80% of farmers together have only 13% of cultivable area. (Renner et al 1997)




## 1.7 Agrarian reform and landless peasants movement in Brazil

- Article 186 of 1988 constitution stipulates that
  "all the land must fulfil social function""land must be used for benefit of all society"
- Federal government can expropriate the land from land owner when it is not apropriately used to fulfil social function.




## 2.2 Background of the study: Deforestation by illegal small farmers

- Fearnside (2008) reported that forest clearance of small farmers is one of seven major causes of deforestation issue in Amazon region.
- However, cultivation at lower Amazon area is mainly based on agroforestry which major products are local fruit trees.
- According to Yamada (1999), above ground biomass of 25 years-old agroforestry fields is about 2/3 of it in natural forest.
- Therefore, when sustainable agriculture and continuous yield could be performed by the small farmers settled in the secondary forest, forest biomass recovery can be achieved.

## 2.3 Can benefits from agriculture contribute to forest biomass gain?

1. Illegal small farmers perform appropriate agriculture.
2. Decrease in expenditure and increase in cash income are expected.
3. The livelihood of those small farmers will improve.
4. The land would be continuously cultivated and tree crops will grow .
5. Therefore, prevents land degradation and increase stand biomass.

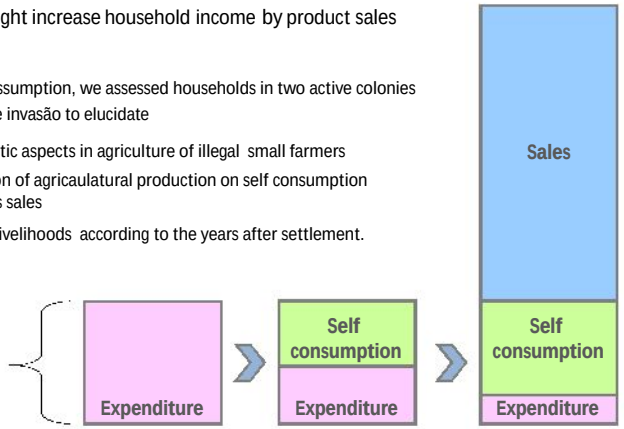
- ✓ What is "appropriate agriculture" for the small farmers?
- ✓ To what extent the "appropriate agriculture" contributes to improve the livelihoods of illegal small farmers migrated to secondary forest?

## 2.4 Assumption and aims of this study

- When their agriculture is appropriate, agricultural yield and natural commons may reduce household expenditure by providing daily necessities.
- Also these might increase household income by product sales

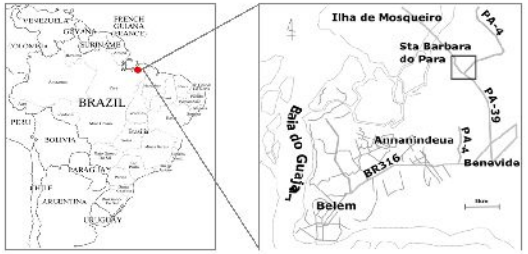
According to these assumption, we assessed households in two active colonies which originally were invasão to elucidate

① Characteristic aspects in agriculture of illegal small farmers
② Contribution of agricaulatural production on self consumption and products sales
③ Change in livelihoods according to the years after settlement.




# 3. Site description and Methods

## 3.1 Study site




Pará state, north region of Federative Republic of Brazil

Municiparity of Santa Barbará, about 30km distance from Belém, the capital of state.

Settlement A and B, both locates 5km from market village.

Table Basic profiles of two colonies, Settlement A and B

| Settlement A | | Settlement B |
|---|---|---|
| 4.5 | Year after migration | 20 |
| 36 | Total household number | 17 |
| 3.9±0.5 | Average family member in a households | 3.8±0.5 |
| 0.317±0.24 | Average harvested area per households | - |

- Settlement A invaded to abandoned secondary forest in January 2006.
- Settlement B got a land tenure after about 5 year occupation 15 years before.

## 3.1.1 Forest clearance in both colonies

- SettlementA is clearing sorrounding secondary forest to extpand crop yards and land for housings.
- SettlementB do not expand the own teritory since land area is fixed after they got a land tenure.


Google map

## 3.1.2 Housings and farms in both colonies

- Housings and electrical appliances is far better in settlement B than in settlementA.
- Crop yard seems well developed in settlementB than in settlementA.


## 3.2 Methods

- Data were collected by interviews and inquiries to habitants in both colonies.
- 29 households in settlement A and 12 households in settlement B have subjected to interview and data analysis.
- GPS data were also measured to calculate the forest harvested areas in ATRAER.
- Information about family histories, livelihood, monthly income and expenditure, number, name and age of planted species were collected by interviews and inquiries.

## 3.3 Major products found in both colonies



Examples of fruits crops

# 4. Results

## 4.1. Characteristics found in agricultural production

### 4.1.1 Profiles of the crop species found in most HHs

Table Top 10 arboreal crop species cultivated

| | | Fruitive age after planting | cultivating Settlement A (n=29) | cultivating Settlement B (n=14) | Usage |
|---|---|---|---|---|---|
| 1 | Assai palm | long | 25 | 12 | Fruits processing (high market value) |
| 2 | Cupassu | long | 24 | 11 | Raw and processing (high market value) |
| 3 | Cashew | short | 21 | 11 | Fruits processing and nuts |
| 4 | Banana | short | 20 | 11 | Raw fruits |
| 5 | Papaya | short | 19 | 11 | Raw fruits |
| 6 | Lemon | long | 16 | 11 | Raw fruits |
| 7 | Pupunha palm | long | 12 | 14 | Fruits processing (high market value) |
| 8 | Abocado | long | 17 | 9 | Raw fruits |
| 9 | Biriba | short | 11 | 11 | Raw fruits |
| 10 | Muruci | short | 18 | 4 | Raw fruits |

Table Top 5 annual crops cultivated

| | | cultivating Settlement A (n=29) | cultivating Settlement B (n=14) | Usage |
|---|---|---|---|---|
| 1 | toxic Cassava | 24 | 11 | Processed staple food (low profit) |
| 2 | Pineapple | 22 | 9 | Raw fruit |
| 3 | non-toxic Cassava | 19 | 10 | Cook (low market value) |
| 4 | Sugar cane | 8 | 6 | Raw fruit |
| 5 | Beans | 7 | | Cook |

- Crop species of the most HHs planted are categorized to three types, ①High benefit, late fruiting species ② Low benefit, early fruiting species ③ Low or no benefit, annual crop species for substantial aim.
- Most HHs cultivating cassava have produced farinha, processed staple diet in north Brazil region made from cassava. Farinha can be sold in markets when it has a certain amount (60kg=100-160Reais 60-90USD).

### 4.1.2 No. of HHs and avg. no planted for each crop species

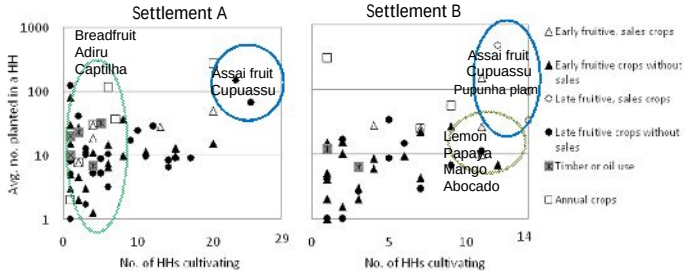
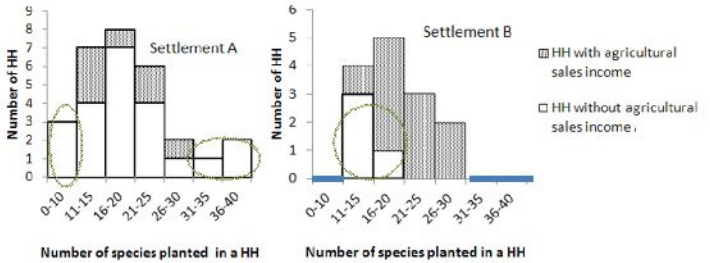



Fig. Relationship between no. of HHs and average no. Planted in each species.
Left: Settlement A, Right: Settlement B.

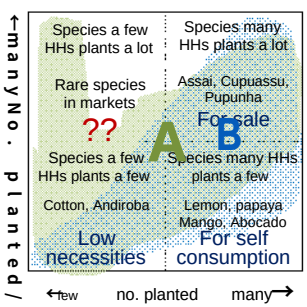
- In settlement A, the late fruitve, high benefit species are intensively cultivated in majority of HHs, but those are not yet fruitive.
- In majorities of HHs of settlement B, also the late fruitve high benefit species, and substantial non-sales crops are cultivated.
- Only in settlement A, there found intensive cultivation of species that are not major products in the markets.

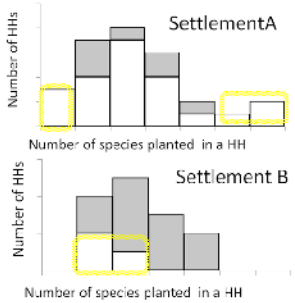
### 4.1.3 Variety of crop species and HH numbers




- In settlement A, HHs without any agricultural sales income was found in the range of least and most species variation.
- In settlement B, no HHs was found in the range of HHs planting species 0-10 and 31-40, which is the range no HHs had agricultural sales income in settlement A.
- In settlement B, HHs without agricultural sales are concentrated in the range of least species variation.

## 4.1.4 Summary of agricultural production




- Species planted a lot in a few HHs often observed in settlement A, whereas other three types are also found in settlement B.
- HHs without any sales products in settlement A, possibly are without any future perspectives, or expecting future harvest of late fruitive, high profit species which currently do not contributes to sales incomes.
- HHs without any sales products in settlement B, possibly are satisfactive with self consumption, in settlement B.

# 4. Results

## 4.2. Economic balance in households

## 4.2.1 Basic information regarding to household economy

Table Numbers and proportions of the households in each income sources.

| | Settlement A | | | Settlement B | | |
|---|---|---|---|---|---|---|
| | Number of households | Percentage | Average (Reais) | Number of households | Percentage | Average (Reais) |
| Below 1USD/person/day | 6 | 20.0% | | 0 | 0.0% | |
| Below 2USD/person/day | 12 | 40.0% | | 1 | 8.3% | |
| Have Job income※ | 21 | 70.0% | 384.3 ± 11.6 | 5 | 41.3% | 596.0 ± 21.2 |
| Have agricultural production sales | 7 | 23.3% | 100.7 ± 5.1 | 8 | 66.6% | 317.6 ± 13.1 |
| Receive Bolsa familia | 11 | 36.7% | | 5 | 41.7% | |
| Receive pension | 2 | 6.7% | | 6 | 50.0% | |

※5 and 2 households gain cash income from both job and agricultural income,in A and B respectively.

- In settlement A, 6 households out of 30 were living below poverty line, while none of the household below the poverty line was observed in settlement B.
- Proportion of the households selling agricultural production is high in settlement B, while it of job income is high in settlement A.

## 4.2.2 Cash gain from agricultural and non-timber forest products

Table. Proportion and cash incomes from agricultural production and NTFPs in ATRAER and Lagoinha.

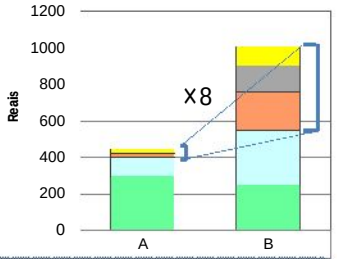
| | Settlement A (n=29) | | | Settlement B (n=12) | | |
|---|---|---|---|---|---|---|
| | No. of households | | Average monthly income of the Households | No. of households | | Average monthly income of the Households selling products (Reais) |
| | Producing or using | Selling | selling products | Producing or using | Selling | |
| Agricultural production | | | | | | |
| Agricultural production | 29 (100%) | 8 (27.6%) | 120.5 ± 4.4 | 12 (100%) | 8 (66.7%) | 317.6 ± 13.1 |
| Farinha production | 24 (82.7%) | 6 (20.7%) | 113.6 ± 7.9 | 10 (83.3%) | 5 (41.7%) | 241 ± 9.4 |
| NTFP | | | | | | |
| Natural fruits gathering | 17 (58.6%) | 0 | | 5 (41.7%) | 1 (8.3%) | 4.75 |
| Charcoal production | 11 (37.9%) | 0* | - | 7 (58.3%) | 7 (58.3%) | 264 ± 38.2 |
| Natural woods use | 24 (82.3%) | 0 | | 9 (75.0%) | 0 | - |

*One household was producing carbon whereas they answered "no"

- All of the investigated households had some agricultural production.
- Compared to A, B is three times higher in average income of the households selling agricultural crops and about double in it of household selling farinha.
- Only one households selling natural fruits but almost half of households are consuming or utilizing natural plants.

## 4.2.3 Household income

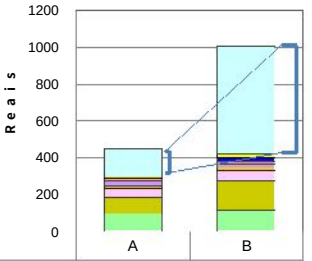
- Total income of settlement B is more than double of it of settlement A.
- Total income of household - products which include agricultural crops, carbon and farinha in B was about 8 times higher than it of A.
- Social welfare was higher in settlement B indicates the difference in proportion of households receiving pension. Since pension is higher than bolsa familia.




| | A | B |
|---|---|---|
| Farinha | 23.5 | 110.0 |
| Charcoal | 0.0 | 140.8 |
| Agricultual production | 24.3 | 211.5 |
| Social welfare | 106.5 | 297.1 |
| Job | 290.4 | 248.3 |

## 4.2.4 Household expenditure

- Even though the proportion against total expenditure is yet small, settlement B spends 10 times more than settlement A in child education (2.08±1.7Rs in A and 21.0±9.2Rs in B) and agricultural investment (1.9±1.1R and 16.4±4.8R).
- No significant difference was found in expenditure for medicine, transportation, fuel materials, clothings, meat and chicken.
- The biggest difference between A and B among expenditure was other payment, which has more than 3 times differnce.



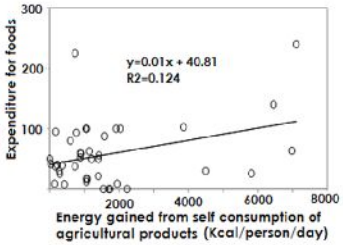

| | A | B |
|---|---|---|
| Other payments | 160 | 586 |
| Education | 2 * | 21* |
| Agricultural investment | 2 * | 16* |
| Medicine | 17 | 16 |
| Deposit | 0 | 0 |
| Transportation | 22 | 23 |
| Gas and carbon | 19 | 14 |
| Clothing | 46 | 59 |
| Other foods | 87 | 160 |
| Meat and chicken | 97 | 113 |

Fig. Breakdown of expenditure
Asterisks indicates significant difference between A and B

## 4.2.5 Agricultural products for self consumption

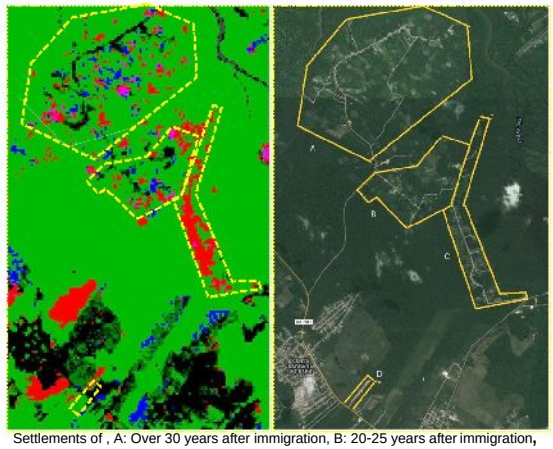
Table Energy gained from self-consumption of agricultural products

| | Settlement A | Settlement B |
|---|---|---|
| Energy(Kcal)/day/household | 3331 ± 555 | 11365±3241 |
| Energy(Kcal)/day/person | 1174 ± 240 | 2870±656 |
| Energy gain from farinha/ total energy from agricultural products | 53.4 ± 5.6 % | 44.3±6.5 % |




- Settlement B gains sufficient energy from self-consumption of agricultural products, and settlement A gained about half of energy essential for male/adult/day.
- Proportion of energy gained from farinha, a staple food made from cassava potato was about 2/3 in settlement A while it of settlement B was about 1/3 which reflects the higher diversity of agricultural products harvestable in settlement B.
- However, no significant relationship was found between energy gained from self consumption and expenditure for food purchase.

## 4.2.6 Tree crop cultivation and forest biomass change in small scale



Settlements of , A: Over 30 years after immigration, B: 20-25 years after immigration, C: immigrated in 2007, agricultural production, D: immigrated in 2007, without agricultural production. Source: *Global Forest Change*, Department of Geographic Science University of Maryland

- Proportions of "gain "and "loss and gain " increased in older settlements (A,B) than in youngers (C, D).
- Both settlements immigrated at 2007 showed only "loss", whereas C has tree crop plantation and D has no tree crop plantation.
- Average area of a household was around 1.5 ha thus about 16 cells of 30m ×30m grids were included in one household teritory.

# 5. Conclusion

## 5.1 Conclusion

I **Characteristic aspects found in agriculture of illegal small farmers**
- All the HHs investigated produce and self-consume any agricultural production.
- Majority of HHs planted high-benefit but late fruiting species in both settlements was observed.
- Selection and combination of the species for plantation is supposed to influence the cash gain.

II. **Contribution from agricaulatural production on self consumption**
- According to increase in agricultural production, increase of cash gain was observed, whereas no decrease in daily food expenditure was observed.

III. **Change in livelihoods according to the years after settlement**
- In older settlement, more HHs gain high agricultural sales than in younger settlement, while more HHs earned wage income due to lack of agricultural sales production.
- Older settlement spend 10times more to education and agricultural investment than in younger settlement.
- Among the expenditure, the most apparent difference between settlement A and B was found in “others”. It is supposed that settlement B invest excess income on equipments like electric pump and macineries essential to produce farinha, which caused to increase income from processed foods and new agricultural products.

# 6. Appendix

## 6.1 How do landless peasants’ movement plays a role in gap society in Brazil?


- Hall (2006) has pointed out that cash transfer program alone do not suffice to attack the root of poverty, and redistribution of wealth should be achieved by means of job opportunity or agrarian reform.
- Cash transfer program offers “cash ”, while landless movement offers opportunity to receive cash proportional to own effort and ability.
- Cash transfer program breaks only one process in poverty cycle, but landless movement has potential to break at least two processes in this poverty cycle.

# 6.2 What is required settlers to start agriculture?

- Annual harvest plan of agricultural productions for self consumption.
- Long perspective-selection and combination of crop species which regards to generate continuous harvest and cash income for settlers.
- Knowledge of growth characteristics in each crop species (fruitive age, light preference, desirable plantation interval, water condition preference etc)

  ➢ Information of crop species essential to predict cash income and foods for self consumption, like harvest season, amount of harvest, market values, may give better chance for illegal small farmers.

Fig. Lecture of agroforestry for illegal small farmers at Tomeacu province.