SURVEY'S DATA FROM INDIA DISTRICT

The research project *"Produzione di cibo appropriato: sufficiente, sicuro, sostenibile"* is caracterized to have 3 different districts where to operate:

- Piacenza (Italy)
- Meghalaya (India)
- Kabinda (Democratic Republic of Congo).

that differ for the degree of development.

Before to start with the implementation of actions to improve a sustainable development is necessary to build a multidisciplinary database. It is useful, for the developing countries, in order to help local population to improve vegetable and animal productions and, consequently, their level of nutrition.

During the year 2013 were analyzed about 270 surveys returned from the Meghalaya area.

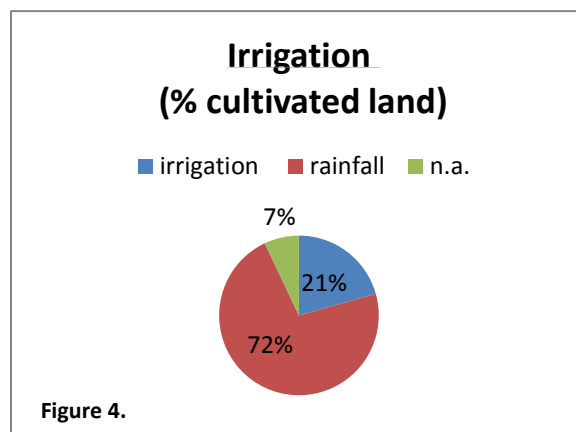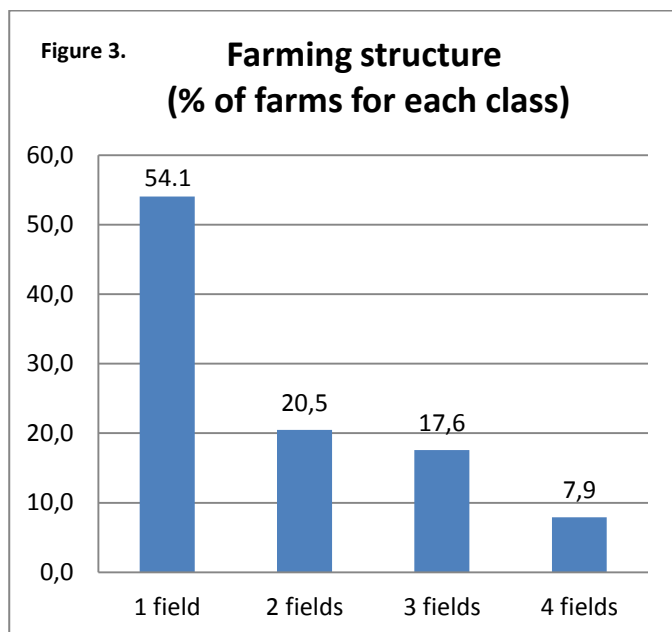The **Agronomic Survey form** was organized into 4 parts:

1. Soil and climate information,
2. Type and surface of the cultivated crops,
3. Map of the farm,
4. Specific agronomic data about the most important cultivated crops.

The part 4 was filled only by a low number of farmers. As a consequence, the data that are available are referred at the general parts.

About the type of soil we can observe that, for the 61% of farmers, is caracterized for a **medium fertility**, the low level is expressed for the 28% of farmers while the 11% had not answered at this question (fig. 1). In addition the type of texute that prevail is the **silty**, in the 88% of farms (fig. 2).
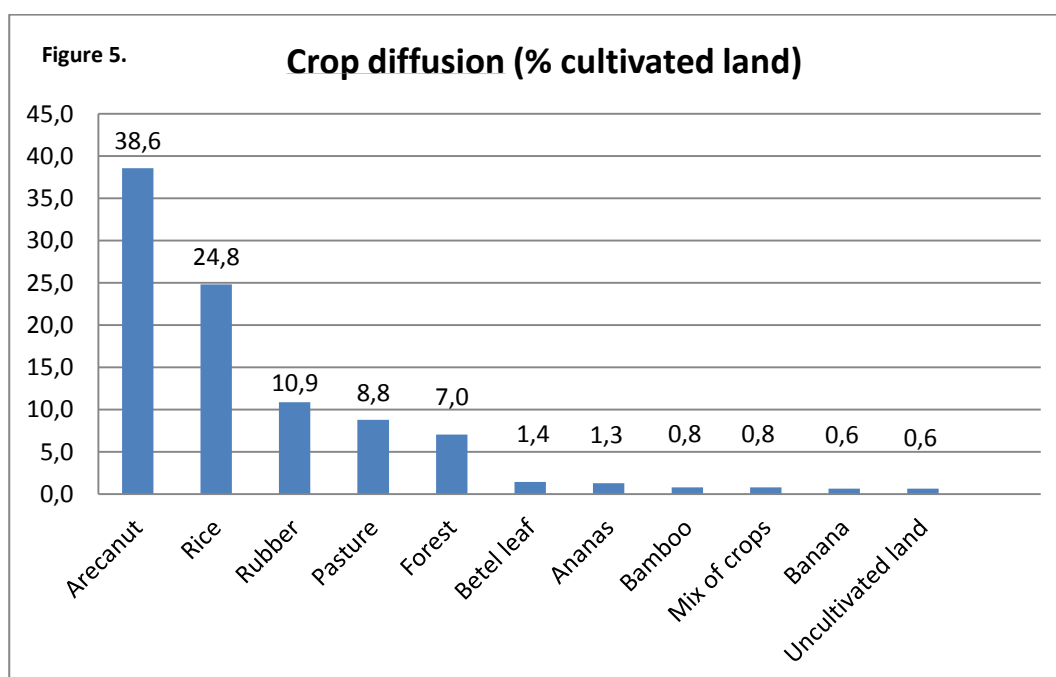

Figure 1.

Figure 2.
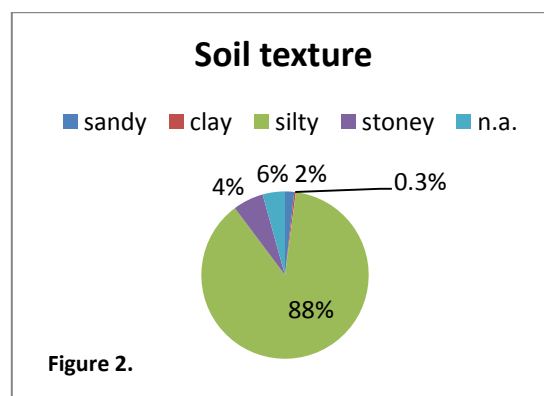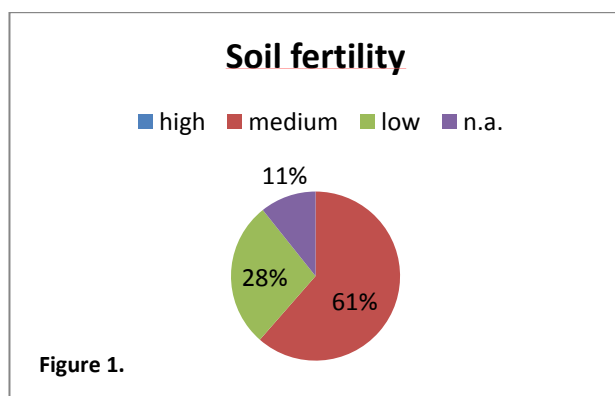
The average farm area is about **1.25 ha** and the average size of the fields is about **0.59 ha**.
The 54.1% of farms are composed by 1 field and only the 7.9% are composed by 4 fields (fig. 3).
This is an important information about the farming structure and organization.

Figure 3.

Farming structure
(% of farms for each class)

	1 field	2 fields	3 fields	4 fields
	54.1	20,5	17,6	7,9

Figure 4.

Irrigation
(% cultivated land)

■ irrigation ■ rainfall ■ n.a.

7%
21%
72%

The agronomic practice of irrigation is spread on the 21% of the cultivated land in the region under analysis. The 72% of the cultivated area is submitted only at natural water supply (fig. 4).

In figure 5 are shown the major crops that are cultiveted in this area. At the first place arecanut that is spread on the 38.6% of cultivated land, at the second place rice (24.8%) and at the third place rubber (10.9%). There are other crops but their diffusion is lower than the 10% of the cultivated land.

Figure 5.

Crop diffusion (% cultivated land)

Arecanut	Rice	Rubber	Pasture	Forest	Betel leaf	Ananas	Bamboo	Mix of crops	Banana	Uncultivated land
38,6	24,8	10,9	8,8	7,0	1,4	1,3	0,8	0,8	0,6	0,6

For each crop is calculated the average farm area (ha) addressed to it (fig. 6). The average area values are between 0.2 and 0.8 ha, according to the values of the farming structure. What is important to observe is that an average of 0.8 ha for farm are probably uncultivated.
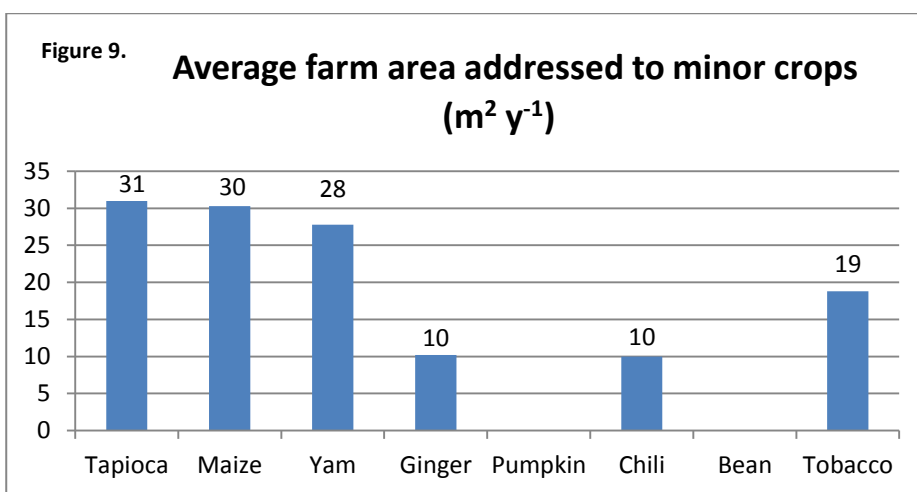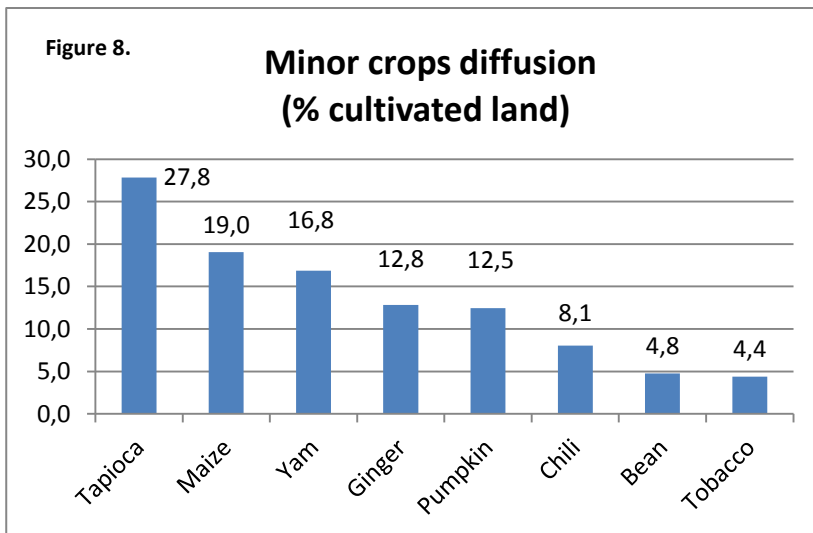
Figure 6.

Average farm area cultivated for each crop (ha)
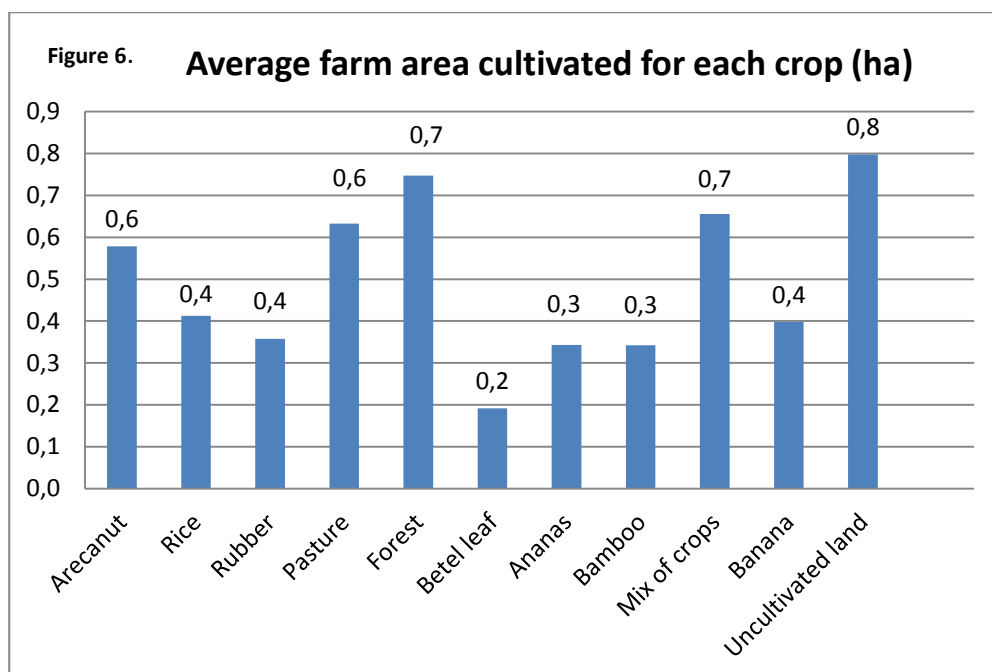
Another important parameter, to analyse, are the agronomic yields obtained in this area. Unfortunatly, from the surveys are available only the average farm yields for arecanut and rice (fig. 7), for the other crops farmers had not answered at this question.

Figure 7.

Average farm yields (Mg ha^{-1})
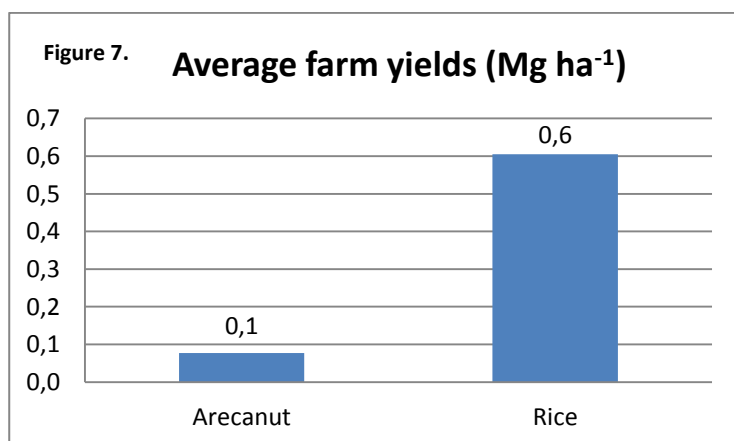
Arecanut shows an average farm yield of 0.1 Mg ha^{-1} that is lower than values of 3-5 Mg ha^{-1} founded in literature. The average yields for the rice is obout 0.6 Mg ha^{-1}. For this crop is possible to say that the yields are less 10 times compared to the yields obtained with the traditional varieties of rice cultivated in India.

Besides the extensive crops, farmers are interested to cultivate other crops on a minor farm's area.
In figures 8 and 9 are represented the values of diffusion of the minor crops, in % of cultivated land, and the values about their cultivated farm area (average farm area per year).
It is possible to observe that tapioca, maize and yam are the most spread minor crops spread in this region and they have an addressed farm average area near 30 m^2 y^{-1}.

Figure 8.

Minor crops diffusion (% cultivated land)

Figure 9.

Average farm area addressed to minor crops (m² y⁻¹)

In the figure below are represented the average far yields realized for the minor crops considered.

Figure 10.

Average farm yields (Kg m⁻²)
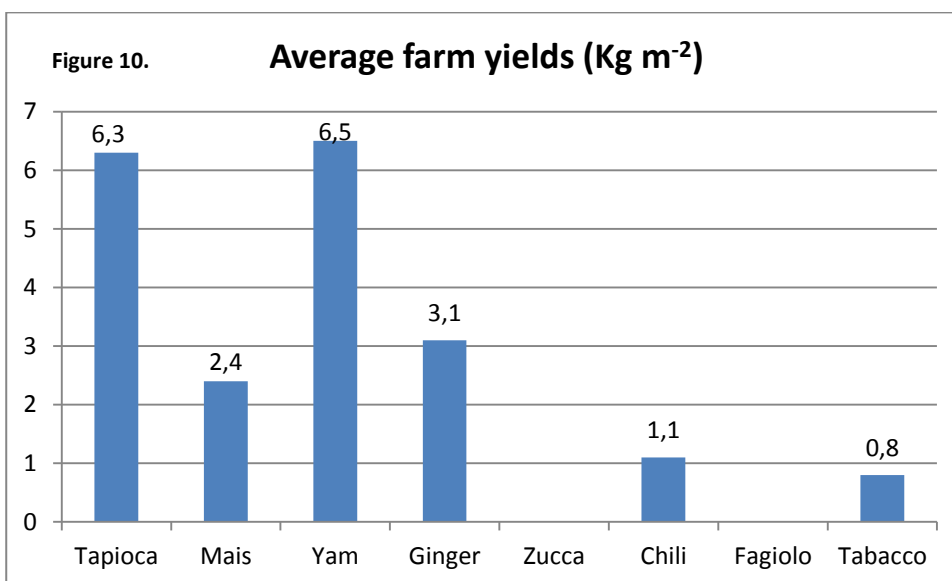
The last parameters that we had analysed are the utilization of crop rotations and fertilizations on the minor crops considered (fig. 11).

Figure 11.

Utilization of crop rotations and fertilizations (% of farms)
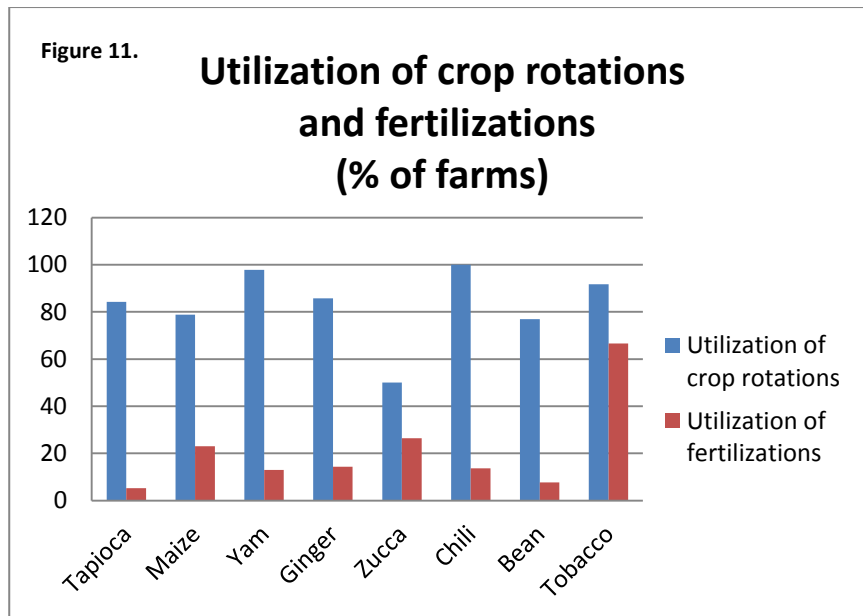
It is possible to observe that crop rotations are utilized for all minior crops, in a high percentages, but fertilizations practices are not so spread . Fertilizations are used for tobacco by about 70% of farms but for the other crops are used by a percentages of farms not greater than the 20%.

These data give an initial overview on the agronomic situation in the Meghalaya area submitted at this project. It is a first basic step in order to understand what are the main difficults for the local farmers and, so, propose some practices/actions to implement their agronomic productions.

SOIL ANALYSIS

During two travels in the Meghalaya District were collected some soil samples that are analysed by the laboratory of the Istitute of Agronomy (UCSC Piacenza). In the table below are represented the data of one sample from the first travel occurred in February 2012 (G. Bertoni – F. Cappa) and 5 samples from the second travel occurred in November 2012 (G. Bertoni – V. Tabaglio).

Date	Sample	Place	CLAY %	SILT %	SAND %	TEXTURE USDA	pH in H_2O	pH in KCl	Total Limestone (% $CaCO_3$ d.s.)	O.M. % d.s.	N tot. % d.s.	C/N	P ass. mg kg^{-1} d.s.	K scamb. mg kg^{-1} d.s.	C.S.C cmol$^+$ kg^{-1} d.s.
14-22/02/12	India	Tikrikilla	23.6	62.3	14.1	Silt Loam	4.9	4.0	0	3.1	0.10	18	4.5	90	16
6-15/11/12	1	Tikrikilla	21.1	56.7	22.2	Silt loam	4.7	3.7	0	2.3	0.12	11	12.8	332	12
6-15/11/12	2	Katdongre	25.2	52.3	22.5	Silt loam	5.3	3.4	0	2.5	0.12	12	8.0	79	12
6-15/11/12	3	Dingbangre	26.2	49.2	24.7	Loam	4.5	3.6	0	2.3	0.11	12	9.9	84	11
6-15/11/12	4	Toirangre	25.0	46.9	28.0	Loam	4.9	3.6	0	2.4	0.12	12	13.9	289	12
6-15/11/12	5	Darenchigre	36.2	52.7	11.1	Silty clay loam	4.8	3.5	1	2.7	0.12	13	10.0	59	15

This data shows that this soils have a silt content from 49.2 to 62.3%, so the **texture** classification varies from *loam* to *silt loam* (USDA classes). About the **pH** it is possible to observe that in water all samples are *strongly acid*, the analysis in KCl confirm this classification. The total limestone content is maximum 1 only in one sample, so this soils are *poor in CaCO₃* content. Surprisingly, the **organic matter** content is high: they are *average-endowed* (1.5-2.5%) or *well-endowed* (2.5-3-5%). An high level of soil organic matter is important for plant nutrition and for the chemical and physical soil properties. Also for the **total N** content this soils are classify as *average-endowed* (0.10-0.15%). The **C/N ratio** varies between 11 to 18, values near 11-13 are sinonimous of a good level of organic matter umification, if the ratio is higher, near 20, indicates a low level of soil organic matter decomposition due to at the low amount of N in the soil. About the **P ass.** it is possible sais that a level under 10 mg kg^{-1} of dry soil are sinonimous of a *scarce endowement* of this nutrient in acid soils, a well endowement is beetween 20 and 30 mg kg^{-1} of dry soil. About the **K scamb.** only two samples are *poor-endowed* (< 80 mg kg^{-1} of dry soil), the other samples are *well-endowed*. Finally, the **C.S.C.** values are major than 11 cmol$^+$ kg^{-1} of dry soil that reveals an *average capacity* of the soil to exchange cations with the circulating solution.