Report

Household weeding practices in south western region of Madagascar

Africa Rice Center (AfricaRice), Madagascar

Contact: Ms. Raharimalala Andrialalao Sophie, Research Assistant (Agronomy)
Dr. Kalimuthu Senthilkumar, Agronomist

Background and objective

In Madagascar, 2 prototype motorized weeders were imported by AfricaRice in 2020. These machines were piloted in the region of Menabe (western of Madagascar) and some adaptations were made together with local fabricator to match the spacing of rice used by farmers in the region. Demonstration and testing were completed with rice farmers from Ankilizato in 2021 during the two rice growing seasons.

The next step of the activities aims to promote and diffuse the motorized weeders. Thus, farm surveys were conducted in two locations in order to study rice farmers' weeding practices. During the survey, farmers were asked about questions related to all farming practices in general. However, the present report reports only the households' weeding practices.

Survey itinerary

- Date: from 6th to 11th September 2022
- Location: Ankilizato and Malaimbandy, in the Menabe Region of Madagascar
- Enumerators: the survey was conducted by two research assistants from AfricaRice and by the support of five local enumerators (originated from the study areas).

Methodology

- **Preparation of the survey questionnaires**

In 2021, similar study was already conducted by researchers working with AfricaRice with rice farmers from the Doho Irrigation Scheme in Uganda. So, the survey questionnaires that we used in Madagascar were adapted from the questionnaires used in previous survey in Uganda. The questionnaires were translated in local language to facilitate communication with farmers.

- **Data collection and data analysis**

Data were collected with tablets using ODK Collect application. The different types of data collected during the survey are presented in the table 1.

After data collection, descriptive analysis was preformed to describe the farmers' weeding practices followed by multiple correspondence analysis in order to understand the determinants of the rice farmers' weeding practices. Different variables such as the plot size, use of improved varieties, methods of crop establishment (planting in line, loosely in line or random transplantation), the status of farmer on the rice plots (owner, tenant or borrowed) and the existence of revenue-generating off-farm activities were taken into account while analyzing the determinants of the rice farmers' weeding practices.

Table 1 : *Categories of collected data*

Categories of data	Details
Household (HH) information	Information on the head of the HH (name, gender, age, marital status, level of education); information on the other members of the HH (number of people in the HH, gender); decision making in the HH.
Plot information	Total number of plots cultivated by the HH, plots location, number of rice plots, size of rice plots, water status of the rice plots, status of the farmers on the rice plots (owner/ tenant).
Rice production (in the last 12 months)	Number of growing seasons per year per land, access to and use of improved varieties, crop management, weed management, types and proportion of labors involved in weeding, fertilizer management, pest management, equipment involved in rice production, cost of each operation for rice production, paddy rice yield, revenue-generating off-farm activities, farmer association, practice of collective farming.
Willingness to pay for motorized weeding service	Amount that farmers are willing to pay for motorized weeding service per Are (i.e., 100 m^2 area), payment methods, interest in a partnership and preferred length of partnership.
Experience of food security in the HH	Food quality and quantity of the HH, length of lean season and period of abundant food, self-assessment of the HH food security.

Results

- In total, 187 rice farmers from 142 households took part in the study (*cf Table 2*).

Table 2: *Number of interviewed farmers and distribution of households*

Study location	Ankilizato	Malaimbandy	Total
Number of households	97	45	142
Number of farmers	125	62	187
Male	*50*	*33*	*83*
Female	*75*	*29*	*104*

1. Description of rice farmers' weeding practices

Four parameters were considered to describe the rice farmers' weeding practices: the weeding frequencies, the types of weeding operation, the composition of laborer and the average cost of hired labor for weeding.

- **Weeding frequencies**

The frequencies of weeding are presented in the table 3.

Table 3: *Weeding frequencies*

% Farmers according to their weeding frequencies	One time	Two times	Three times	More than three times
Ankilizato	21.6	73.2	5.2	0.0
Malaimbandy	22.2	62.2	15.6	0.0
Overall	21.8	69.7	8.5	0.0

The table 3 shows that about 20% of the interviewed farmers weed their rice plots only one time. In general, farmers weed their rice plots two times. Just few farmers (lower than 10%) weed their fields three times and none of the interviewed farmers practiced weeding more than three times.

- **Types of weeding operation**

In general, 30% of respondents practiced hand weeding only while 11% of the farmers practiced only mechanical weeding using push rotary weeder. More than 50% of respondent combined mechanical weeding followed by hand weeding. None of the interviewed farmers used motorized weeder yet (cf table 4).

Table 4: *Types of weeding operation*

Types of weeding operation	Ankilizato	Malaimbandy	Overall
Hand weeding only	32.0	26.7	30.3
Mechanical weeding only (push or mechanical weeding)	9.3	15.6	11.3
Mechanical followed by hand weeding	58.8	57.8	58.5
Motorized weeding	0.0	0.0	0.0

- **Proportion of laborer**

Composition of required laborer for weeding is represented in the figure below.

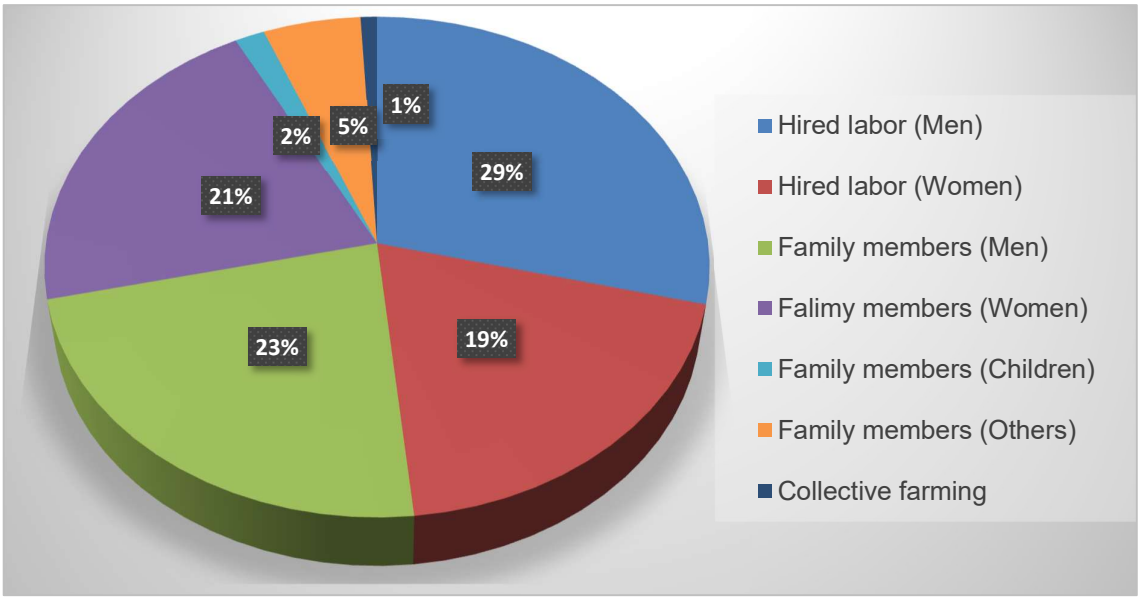

Figure 1: *Composition of laborer used for weeding*

In general, hired labor (men and women combined) and family members (men, women, children and other family members combined) represent each other about half of the required laborer for weeding. Collective farming represents only 1% of the laborer.

- **Average cost of hired labor for weeding**

Because hired labor represents half of the required labor for weeding, the average weeded area per unit of time and the average costs of hired labor per unit area following the types of weeding operation are presents in the table below.

Table 5: *Average weeded area per unit of time and the average cost per unit area*

Types of weeding operation	Average weeded surface per hour (Are/ h)		Average Cost per unit area (MGA/ Are)	
	Men	**Women**	**Men**	**Women**
Hand weeding	1.4	1.2	1869.9	1600.4
Mechanical followed by hand weeding	1.5	1.6	992.0	991.9
Mechanical weeding	0.9	-	1830.0	-

2. Determinants of the households' weeding practices

The table 6 and figure 2 summarized the results of the multiple correspondence analysis.

The analysis of Indicator Matrix in table 6 summarizes the decomposition of the variables and shows the inertia accounted for by each component. Note that, the inertia for a component describes the amount of variation the component explains.

Table 6: *Analysis of indicator matrix*

Particulars/ Principal components	**F1**	**F2**	**F3**	**F4**	**F5**	**F...**	**F14**
Inertia	0.3	0.2	0.2	0.1	0.1		0.0
Proportion (%)	16.6	13.3	10.0	9.0	7.7		1.1
% Cumulative	16.6	29.8	39.9	48.8	56.6		100.0
Adjusted inertia	0.0	0.0	0.0	0.0	0.0		
Proportion (%)	44.7	18.9	4.2	1.6	0.2		
% Cumulative	44.7	63.6	67.9	69.5	69.7		

According to this table, the first principal component (axis/ dimension) F1 accounts for the most inertia of approximately 44.7% followed by the second principal component F2 which accounts about 18.9% of inertia. Cumulatively, approximately 63.6% of the total inertia is accounted for by the first 2 components (F1 and F2). Even though, 14 components/dimensions are required to represent all of the relativities of the studied variables (cumulative inertia of 100%), the first 2 component (F1 and F2) can be considered to explain the variability of the data.

The figure 2 represents the principal coordinates for all the studied variables in the first 2 components F1 and F2. It is divided into four quarters which are composed of the positive or negative part of each axis: (F1-; F2+), (F1+; F2+), (F1+; F2-) and (F1-; F2-). This chart is used to explain the relationships among all the variables and to help interpret the principal components in relation to the variables.

Each point represents a variable. Points that are farther away from the origin indicate variables that are more influential. For example, the variables "Crop establishment-random transplantation" and "Number of growing season-one" are most distant from the origin along the horizontal axis/component F1. This corresponds with the relatively high contribution of these variables for the component F1.

Points on opposite sides of the plot indicate that a component contrasts these variables. For example, the variables "Use of improved varieties-Yes" and "Use of improved varieties-No" are on opposite sides of the origin for both axis F1 and F2 means that F1 and F2 contrast these variables.

Analysis of each variable's coordinates and the contribution of each variable (table not shown) on each components help to determine in which of the two components each variable have

higher contribution and help to identify different groups of variables. Here, we found that most variables have higher contribution on the components F1 and identified 2 groups of variables (green and orange circles). Variables included in a same group have positive correlation with each other. However, groups of variables in opposite side of a components are contrasting. Here, the green circle is in opposite side of the orange circle along the component F1 means that these two groups are contrasting to each other.

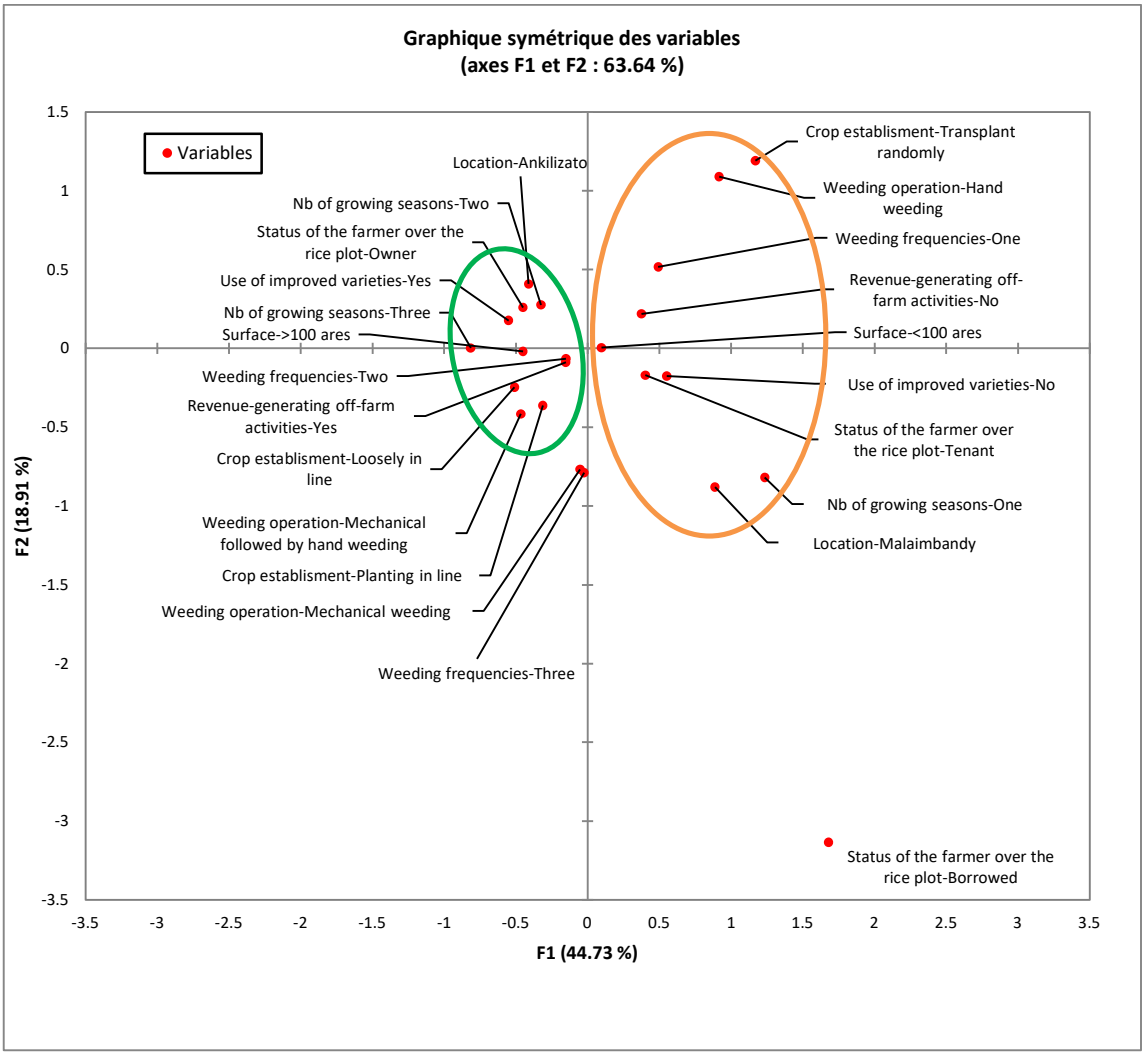

Figure 2: *Multiple correspondence analysis*

Hence, interpretation of this chart allows to say that rice farming systems in Ankilizato is completely opposite of Malaimbandy. In Ankilizato, the average size of the rice plots is bigger (>100 Ares) and most of farmers are the owner of the rice plots. Farmers from Ankilizato are able to grow rice more than one season per year and practiced some of the rice GAP

components such as planting in line (or loosely in line), use of improved varieties, two or three weeding and use of mechanical weeder.

However, farmers from Malaimbandy grow rice in smaller plots (<100 Ares). Most of them are tenant or borrower and grow rice only one season per year. They still use local/traditionnal varieties over improved varieties, transplant randomly thus practice hand weeding only. Most of the farmers from Malaimbandy weed their rice plots just one time during the growing season (so the number of GAP components practiced by them are low).

The figure 2 shows that there is a strong relationship between the farming system and the weeding practices. Farmers who have bigger plots tend to weed their plots with mechanical weeder as this practice allows to save time. Farmers who already followed some of the GAP components (e.g. improved varieties, planting in line) practiced good weeding practices in their fields (two or three weeding, use of mechanical followed by hand weeding).

The status of the farmer over the rice plot and the existence of revenue-generating off-farm activities play as well a great role in determining the farmers' weeding practices. Farmers who are tenant are not really interested in investing much in purchasing in-puts such as seeds, fertilizer or in works (weeding more than one time). As they have to share the products with the owner of the field, they won't get any profit. Same with farmers who don't have revenue-generating off-farm activities because they don't have financial means to weed their fields more frequently.