RESEARCH PROGRAM ON Dryland Systems

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Summary of results in Gender preference in dual purpose crops in Niger along with farmer field trials.

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Food security and better livelihoods

for rural dryland communities

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SUGGESTED CITATION

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SECTION I – Key MESSAGES

Challenges:

Rain-fed agriculture and agro-pastoralism systems constitute the main sources of both food and incomes of poor farmers of the West African Sahel countries such as Niger which faces the vagaries of climate change that effect environment, economic, and social habits of exposed populations. Niger is the poorest country of the world where poverty affects rural areas more than urban areas, and is more pronounced among the female population. Women are generally considered to be at the lowest rung of the poverty ladder as they represent 70% of people living in poverty; also 96% of households headed by women are considered poor. Ensuring food security for small-scale, vulnerable farmers is becoming more and more challenging. Even though a good number of improved varieties of cereals and legumes have been released for different agro ecologies of Niger by research institutions. Yet the majority of farmers still prefer their own saved seeds. Women are main custodian of local seeds .And whenever the word *farmers is* used it is always considered as men. And yet in Niger, women represents 36% of the economically active population in agriculture (FAO, 2013). This necessitates to understand what are women and men preferences in the crops they cultivate, the varieties they chose and the constraints faced by them to better manage risks and improve their livelihoods by diversifying the farming system and rural income.

Against such a backdrop thus the specific objective of the study were:

1. An integrated analysis of social, economic and environmental dynamics considering the crop-livestock system.
2. An analysis of livestock biodiversity and main local crops including preferences, practices and producers' knowledge by taking gender into account.
3. A participatory analysis of local constraints to the production system, strengths and opportunities to improve the resilience of crops and livestock in local agro-ecosystems.
4. An analysis of the performance of the favorite main crops at farm level and at the analytical laboratory along with ex-situ conservation

The present paper reports the preliminary summary of findings of the social, economic and environmental dynamics, analysis of crop and livestock biodiversity including gender preferences, practices and producers' knowledge along with an analysis of the performance of the favorite main crops at farm level and evidence from the laboratory

Methodology:

The survey was conducted in purposive selected Milli and Gourjia villages of Niger. The criteria of selection was 0.35 aridity index (AI), 70 habitation km2 population density (PD). The methodology utilized various mix –methods, utilizing secondary sources of information, participatory qualitative tools of socio-economic gender analysis (SEGA) approach and other tools like such rank based quotient, four square analysis, joint and separate focus group discussions with men and women farmers. A methodology was prepared for the gender survey and crop trials in the month of April. The training of enumerators was done by June 2015 on the methodology for the gender preference and crop trial. The team of consisted of one local staff, one intern from University of Maradi (for crop trial) and two surveyors (gender survey). The data on gender preference on dual purpose crops survey and farmer trials were collected between a periods July to November 2015. To test the performance for grain and fodder yield of farmer preferred varieties under farmer conditions trials were conducted on (Millet and cowpea) with two type of variety each (a local variety and improved variety) with four treatments and three replications in each village. The various treatments were as follows:
T1: HKP + IT90
T2: HKP + Mai HITILA
T3: EKA DAN + IT90
T4: DAN + EKA Mai HITILA

The experimental design used randomized complete block design with three replications. The distance between plant of millet was 0.8m and those between the lines of 1m. The distance between the cowpea was 0.6 m and those between the lines of 0.8m. A total of 24 farmers in two villages were selected for the farmer field trials with two crops. The data was recorded for destructive and non-destructive observations and analyzed using descriptive statics and ANOVA. Further crop germplasm from the two villages were collected for ex-situ conservation. Apart from that, to understand the zinc and iron mineral content in the grains, grain samples were collected and were subjected to non-destructive method for analyzing mineral nutrient contents from grain through X Ray Fluorescence analyser (XRF) machine. To understand the fodder quality traits for nitrogen, neutral (NDF) and acid (ADF) detergent fiber, acid detergent lignin (ADL), in vitro organic matter digestibility (IVOMD) and metabolizable energy content in crop residues using Near Infra Red Spectrophotometry (NIRS),the samples were sent to ILRI India Laboratory.

Key Findings and their Implications:

1. Social map by farmers revealed that the Gourjia village had *Katsinaoua, Daourawa, Beri beri, Fulani* and *Gobirawa* ethnicities in the village while at village Milli, *Beri – beri* living in perfect symbiosis with *Gobirawa*, *Fulani* and *Katsinawa* communities. Resource maps revealed the main difference between men and women context were– men farmers observed more things: game place, school, grazing areas, crop fields, wild animals., while the women context was of grainery, markets, irrigated farming. Unlike Gourjia, Milli had the largest population, had less cultivated areas representing less than half those of Gourjia (376 Ha). In both the villages resource picture card tool revealed that in terms of agriculture, both men and women in the households practiced field works, the field products storage and their uses. In case of livestock activities, mainly women practiced animal fattening while the control, management and the decisions on crops and livestock works belonged to men. However, in case of women headed households, control, possession and decisions belonged to women.

2. Rank bank quotient revealed the constraint faced by men and women farmers in crop-livestock system: constraints by women in Milli were: low yield (63.89), insufficient rainfall (61.11) and crop diseases (50) while men reported: low rainfall (81), no access to fertilizer (57.14) and crop diseases (37). Gourjia women farmers main issues were: lack of feeding resources for animals (80.95), while men farmers reported low rainfall (63.5) and less access to inputs (50.5). The main inspect pest reported by the farmers on cowpea and groundnuts were aphids, thrips, pod borer. Apart from that, falling of groundnut leaves before harvest was the main reason in the two villages that men and women farmers were not keen in groundnut cultivation. Above factors contributed to low agricultural productivity.

3. Seasonal calendars from Milli and Gourjia revealed that gender agricultural practices were rainfed (May- September) and irrigated farming (October to April) and livestock fattening (January-December) but women did not graze animals. Cowpea and groundnut crop were sown by men and women during June for rainfed, while October for irrigated farming. Daily activity clock of young women in Gourjia and Milli indicated that they worked more (14-16hours) than young man (10-12hours) towards agriculture, livestock, market, household activities. Women were more involved in the hard work and less involved in decision-making.

4. Four square analysis tool assisted in making an inventory of crop biodiversity and their importance and the number of households using the variety. In the case of Gourjia, many households cultivated on large areas *Dan Eka, Zango* for millet; *Dudu* for sorghum; *Bahaoussa* and *Garangagia* for maize and *Farin ridi* for sesame. These results are common for men and women but in addition of those varieties, women also cultivated *Kerma dutsi* as sorghum variety specifically. As *Kerma dutsi* is cultivated on dunes for its resistance to drought and *Dudu* is cultivated in the valley. But women's accessibility to land in the valley

in large area is limited, so this is why most of women cultivated it on the valley even if they preferred *Dudu* variety for its taste.In the case of varieties cultivated on large areas by few households, women cultivate in addition of *el Mandi* variety of sorghum, *Wiyan bijini* as millet, *Dan Bauchi* as cowpea, *Jan Ridi* as sesame, *Kaikaikoua* as roselle and *Arma* as vanzue. These last crops are essentially specific to women in their agro-business and transformations derived from crops such as spices and condiments for sauces and other menus in the kitchen.

5. In Gourjia the two most available and important cowpea varieties were: *Mai Hutila* and *Jan wake*. In case of Milli village – *Mai hutilla*, *Dan doramawa, Dan adamu*, *Dan bauchi*, *Dan burkina* were the cowpea varieties sown. In Gourjia crop matrix tool revealed that *Mai Hutila* variety was number one cowpea variety by men and women. This variety was considered best for both rainfed and irrigated farming for both for grain and forage production. Men gave 2nd rank to *IT90* variety because of its high market value, while women preferred *Jan Wake* because of its taste. In the case of village Milli: men preferred *Dan Doramawa* for its grain yield than *Dan Bauchi* preferred by women for its forage yield. In case of Gourjia and Milli, groundnut *El Masara* variety was largely preferred for grain and fodder production even if it got a longer cycle duration. Groundnut seed was more valued than the grounder fodder, while in case of cowpea, cowpea fodder and husk were equally important like cowpea seed. The local varieties offered only medium but reliable yields, seeds were accessible, under variable climatic conditions and without the use of agro-chemicals. The cattle breeds preferred by men and women of two villages were Ba haouche, Bar haje. While in case of sheep breeds men and women in Gourjia preferred Ba houde, Ba haouche while in case of village Milli the gender preference was Ba Haouche and Balami. Gender preference in Gourjia was for goat breed were: Jan akuya, Guitsawa, Fara akuya., while in Milli it was Akuya haoussa, and Akuya arewa. The reasons of preference were mainly accessibility, economic fattening, more resistant to diseases.

6. The preliminary results from the trial revealed (table 1) that in the case of millet, cyclical factors of vegetative development reveal that Dan Eka variety and HKP –improved variety of millet reached 50% flowering and maturity between the same range of days. The main differences were Dan Eka produced more fodder, had longer panicle length, more panicle weight and less grain than HKP.

Table 1: Destructive and non-destructive observation in Pearl Millet

Summary statistics:					Summary statistics:				
Dan Eka Gourjia					HKP Gourjia				
Variable	Minimum	Maximum	Mean	Std. deviation	Variable	Minimum	Maximum	Mean	Std. deviation
Plants harvested/4mx4m	6.67	16.33	11.56	3.41	Plants harvested/4mx4m	11.33	18.67	14.67	2.64
Flowering (Days)	66.00	70.00	67.83	1.60	Flowering (Days)	66.00	75.00	71.83	3.19
Maturity (Days)	75.00	88.00	83.89	5.64	Maturity (Days)	85.33	91.00	87.39	2.44
Panicle length (cm)	90.33	100.67	94.17	4.27	Panicle length (cm)	67.00	86.33	76.94	7.96
Panicle weight (g)	208.00	231.33	217.44	8.64	Panicle weight (g)	158.33	195.67	178.61	12.85
1000 grains weight(g)	8.60	10.10	9.58	0.61	1000 grains weight(g)	9.93	10.70	10.26	0.26
Grain weight/sub-plot (g)	2.10	3.03	2.47	0.36	Grain weight/sub-plot (g)	2.40	3.67	3.02	0.53
Stem weight (g)	1.70	2.30	1.93	0.23	Stem weight (g)	0.73	1.33	0.96	0.22
Diseases	0.00	0.00	0.00	0.00	Diseases	0.00	1.00	0.50	1
Summary statistics:					Summary statistics:				
Dan Eka Milli					HKP Milli				
Variable	Minimum	Maximum	Mean	Std. deviation	Variable	Minimum	Maximum	Mean	Std. deviation
Plants harvested/4mx4m	10.00	24.00	14.61	5.02	Plants harvested/4mx4m	13.33	22.67	15.89	3.53
Flowering (Days)	73.00	75.00	73.44	0.81	Flowering (Days)	73.00	73.00	73.00	0.00
Maturity (Days)	80.00	82.00	81.33	1.03	Maturity (Days)	88.00	91.00	89.50	1.38
Panicle length (cm)	90.33	98.00	94.06	2.59	Panicle length (cm)	70.33	81.67	76.44	4.67
Panicle weight (g)	212.00	224.00	217.33	4.37	Panicle weight (g)	151.00	197.00	177.28	17.02
1000 grains weight(g)	8.10	10.23	9.17	0.71	1000 grains weight(g)	9.80	10.67	10.18	0.32
Grain weight/sub-plot (g)	2.67	3.30	2.98	0.28	Grain weight/sub-plot (g)	2.77	4.03	3.40	0.42
Stem weight (g)	1.67	2.00	1.79	0.14	Stem weight (g)	0.63	1.23	0.85	0.22
Diseases	0.0	0.00	0.00	0.00	Diseases	0.00	1.00	0.17	0.41

In case of cowpea IT90 (table 2) variety was superior to Mai Hutila local variety in terms of flowering, maturity, pod length, fodder and disease resistance although Mai Hutila was most preferred. The detailed report is underway.

Table 2: Destructive and non- destructive observation in cowpea

Summary statistics:					Summary statistics:				
Mai Hutila Gourjia					IT90 Gourjia				
Variable	Minimum	Maximum	Mean	Std. deviation	Variable	Minimum	Maximum	Mean	Std. deviation
Plants harvested/4mx4m	16.667	22.333	19.611	2.225	Plants harvested/4mx4m	19.000	26.333	21.833	2.474
Flowering(days)	54.000	62.667	58.444	3.304	Flowering(days)	49.000	55.000	51.444	2.105
Maturity(days)	75.000	80.000	78.167	1.941	Maturity(days)	70.000	75.000	71.611	1.994
Pod length(cm)	9.567	13.333	11.511	1.281	Pod length(cm)	18.000	21.000	19.611	1.255
100 grains weight(g)	13.333	14.667	13.939	0.595	100 grains weight(g)	16.933	17.933	17.511	0.369
Pod weight(g)	113.667	124.333	118.617	3.901	Pod weight(g)	131.967	140.367	136.650	2.845
Diseases	0.000	1.000	0.333	0.516	Diseases	0.000	0.000	0.000	0.000
Forage weight/plant(hg)	0.600	0.900	0.739	0.134	Forage weight/plant(hg)	1.533	2.233	1.928	0.259

Summary statistics:					Summary statistics:				
Mai Hutila Milli					IT90 Milli				
Variable	Minimum	Maximum	Mean	Std. deviation	Variable	Minimum	Maximum	Mean	Std. deviation
Plants harvested/4mx4m	20.667	23.667	22.611	1.124	Plants harvested/4mx4m	18.000	25.000	22.111	2.911
Flowering(days)	54.667	64.667	58.556	3.734	Flowering(days)	48.000	54.333	52.167	2.501
Maturity(days)	77.000	80.000	78.833	1.169	Maturity(days)	69.000	73.000	71.333	1.862
Pod length(cm)	10.100	13.133	11.517	1.109	Pod length(cm)	17.667	20.000	18.889	0.807
100 grains weight(g)	13.300	14.967	13.956	0.595	100 grains weight(g)	15.267	18.567	16.967	1.286
Pod weight(g)	115.233	126.633	120.317	4.239	Pod weight(g)	129.300	139.433	135.356	3.526
Diseases	1.000	1.000	1.000	0.000	Diseases	0.000	0.000	0.000	0.000
Forage weight/plant(hg)	0.600	1.133	0.806	0.177	Forage weight/plant(hg)	1.467	1.933	1.683	0.171

In order to understand the variation in availability iron and zinc- a total of 32 grain samples were collected from the farmer fields and sent to ICRISAT Niger for laboratory analysis using XRF technique.

Table 3: Laboratory analysis for Zn and Iron in grains of millet and cowpea

Sl	Crop	Variety	Location	Fe-total mg/kg	Zn-total mg/kg
1	Millet	HKP	Milli	34.75	34.07
2	Millet	Dan Eka	Milli	44.35	41.97
3	Millet	HKP	Gourjia	37.02	38.05
4	Millet	Dan Eka	Gourjia	39.4	41.87
5	Cowpea	IT90	Milli	52.5	41.87
6	Cowpea	Mai Huitila	Milli	44.9	45
7	Cowpea	IT90	Gourjia	40	45
8	Cowpea	Mai Huitila	Gourjia	42.7	43.12

The results indicated that local varieties of millet (Dan Eka) and cowpea (Mai Huitila) had more availability of Fe in the grains.

Further to understand the fodder quality traits 144 fodder samples were collected from the crop trials of two villages of Milli and Gourjia. content in crop residues. The samples were sent to ILRI India Laboratory for analysis using NIRS technique. The table 4 presents the results.

Table 4: Laboratory analysis for fodder quality traits of millet and cowpea

Mean values for fodder quality traits								
Millet Varieties	dm	Ash	ndm	ndfdm	adfdm	adldm	me	ivomd
Dan Eka(n=72)	93.19	9.65	0.75	68.93	49.37	6.23	5.94	42.75
HKP(n=72)	93.16	9.78	0.85	68.94	47.41	6.22	6.08	43.54
Cowpea varieties								
IT90 (n=72)	91.14	10.98	2.0	62.59	32.38	4.66	9.64	65.28
Mai Hutila(n=72)	91.10	11.58	2.1	61.20	32.96	4.86	9.67	65.17

The improved variety of millet HKP had slightly better nitrogen, in vitro organic matter digestibility (IVOMD) and metabolizable energy (ME) traits, while in case of cowpea local and improved variety had similar nitrogen, in vitro organic matter digestibility (IVOMD) and metabolizable energy (ME) traits

Conclusion:

There is a need to develop climate smart varieties requiring low input, disease and drought resistance, accessible, adapting to local taste. Breeding institutions should consider the gendered distribution of preference and needs of the special traits and integrate them into selection scheme in order to develop relevant variations of women and men. Improved varieties were more demanding with respect to climate, pest requirements. Yields in marginal environments where improved varieties are not adapted can be improved. There is a need to conserve the crop biodiversity in ex-situ conservation and in-situ conservation.