CLIMED

The future of Mediterranean Livestock Farming Systems: opportunity and efficiency of Crop–Livestock Integration

Case study Of New Reclaimed lands in Egypt

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Team 2013-2014

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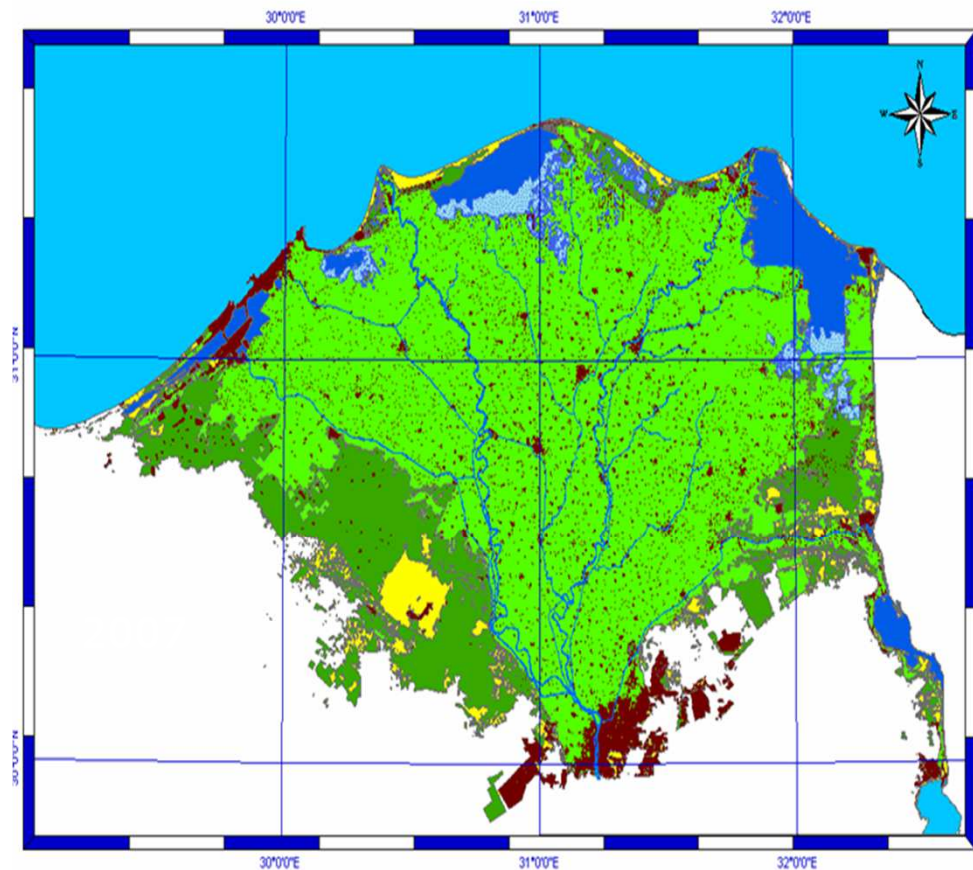
- ## 2 invited:
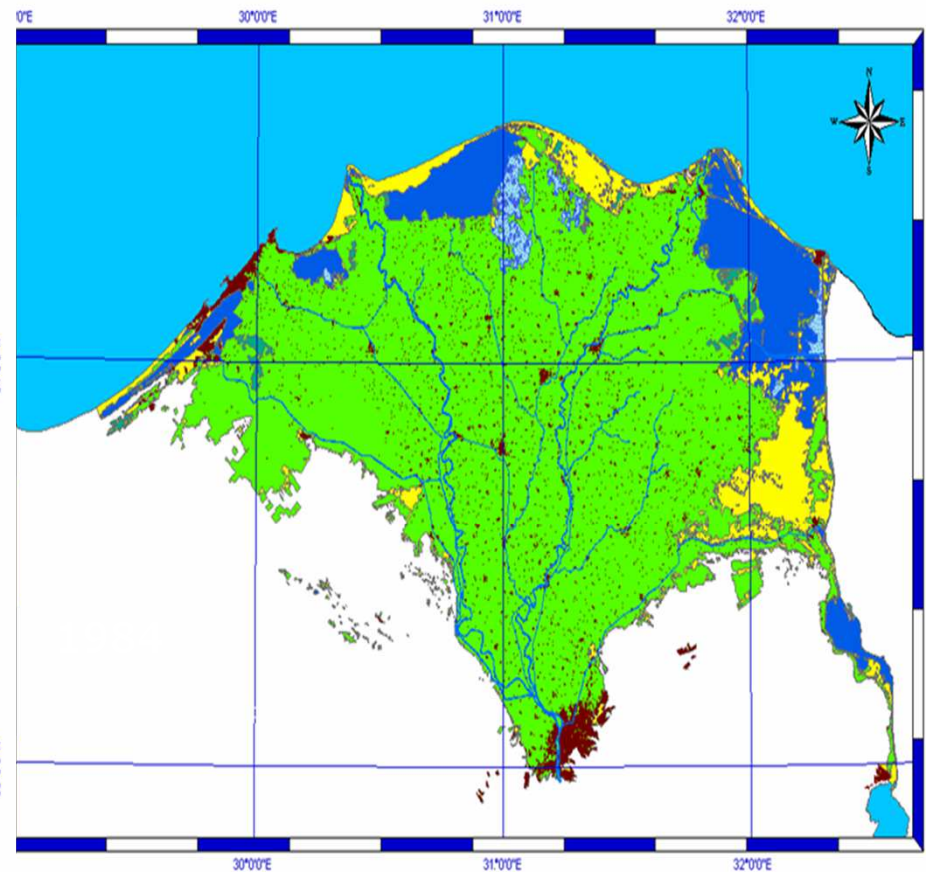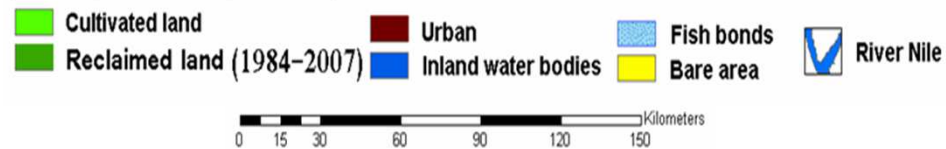   - Bernard Hubert, Jean-Yves Jamin

Plan

- Rapid overview of the zones: NRL

- Main objectives for 2013-2014

- Main achievements
  - Family survey
  - Comprehensive approach of farming system: follow up
  - Protocol: Monitoring for new innovation in 2015-16
- Planned activities for 2015-16

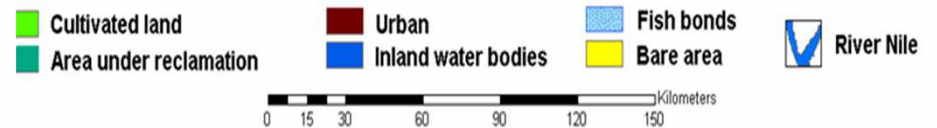(By Adel)

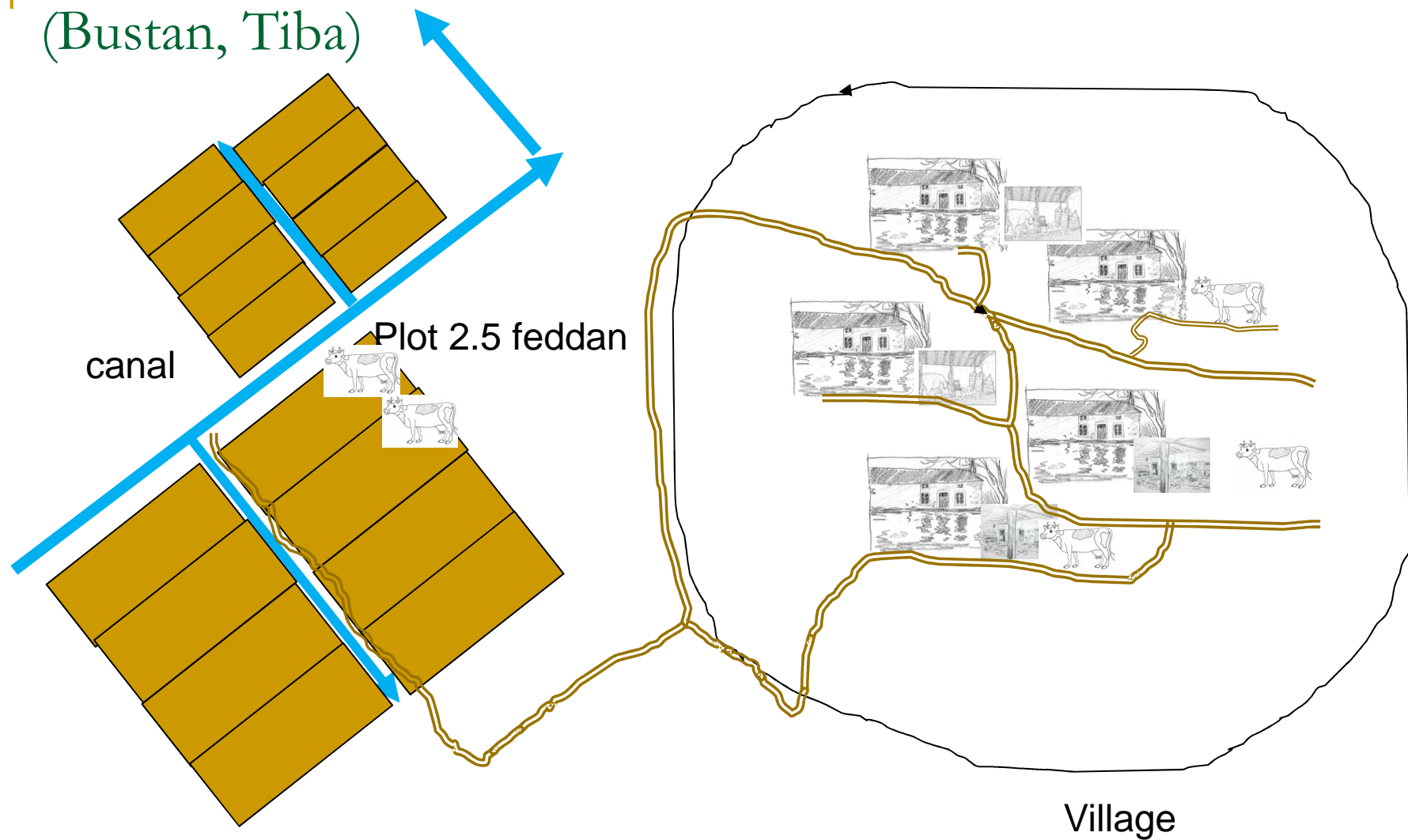Part 1

OVERVIEW OF THE ZONE

Changes of land use 1984 - 2007

Main farming systems in the zone in the New NRL (Bustan, Tiba)
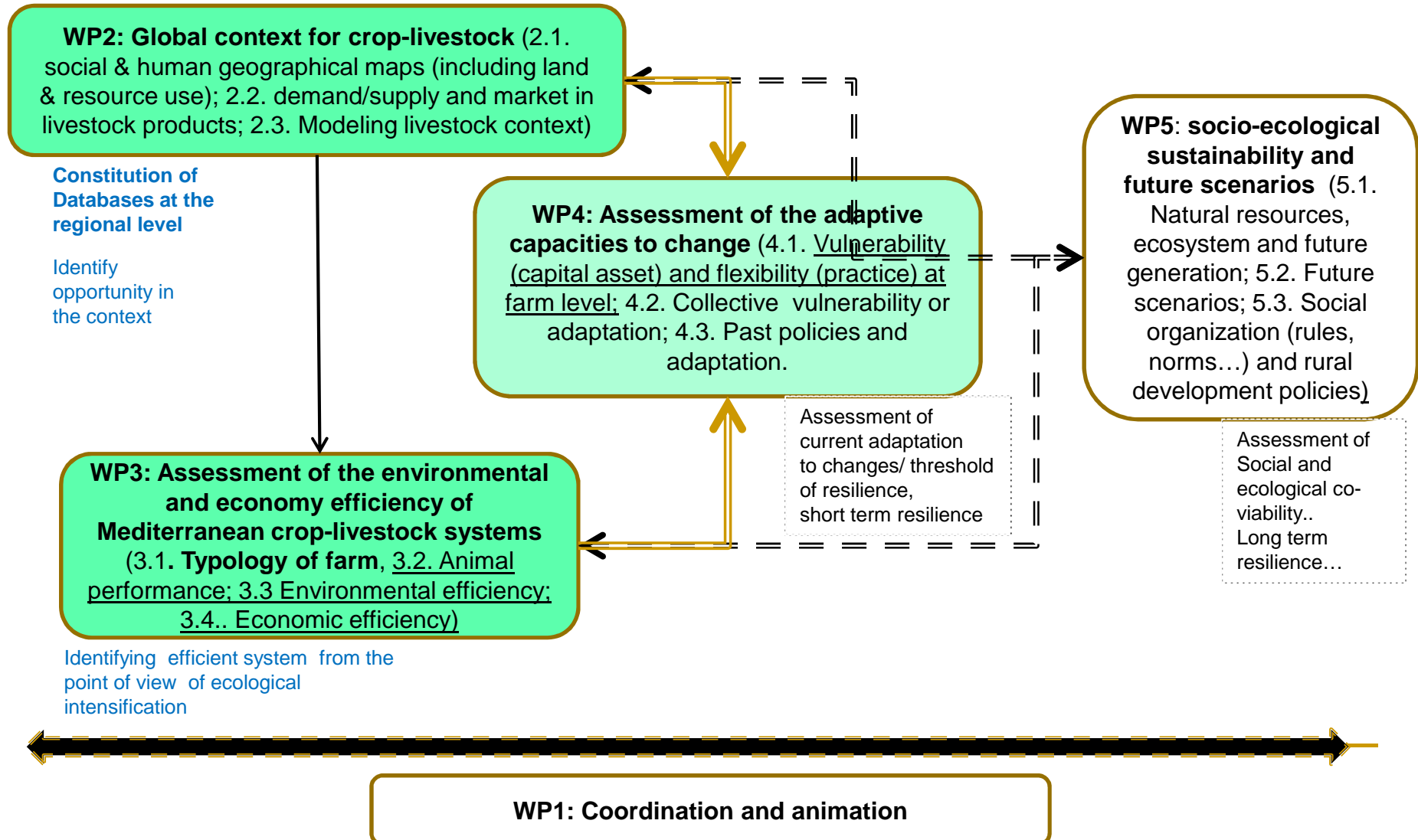
canal

Plot 2.5 feddan

Village

Part 2

MAIN OBJECTIVES

Main objectives based on the statement in April 2013

- **Lack of data at the family and farm level in the NRL**
  - □ → need to constitute a database at the family and farm level to identify the main farming system (typology) (WP2)

- **Understand the crop-livestock integration process to asses the efficiency of the integrated farm system**
  - □ → via farm survey over a large sample ("family survey") and farm follow up over a restricted number of farms ("follow up") (WP3)

Frame of the Project CLIMED

WP2: Global context for crop-livestock (2.1. social & human geographical maps (including land & resource use); 2.2. demand/supply and market in livestock products; 2.3. Modeling livestock context)

Constitution of Databases at the regional level

Identify opportunity in the context

WP4: Assessment of the adaptive capacities to change (4.1. Vulnerability (capital asset) and flexibility (practice) at farm level; 4.2. Collective vulnerability or adaptation; 4.3. Past policies and adaptation.

WP5: socio-ecological sustainability and future scenarios (5.1. Natural resources, ecosystem and future generation; 5.2. Future scenarios; 5.3. Social organization (rules, norms…) and rural development policies)

Assessment of current adaptation to changes/ threshold of resilience, short term resilience

Assessment of Social and ecological co-viability.. Long term resilience…

WP3: Assessment of the environmental and economy efficiency of Mediterranean crop-livestock systems (3.1**. Typology of farm**, 3.2. Animal performance; 3.3 Environmental efficiency; 3.4.. Economic efficiency)

Identifying efficient system from the point of view of ecological intensification

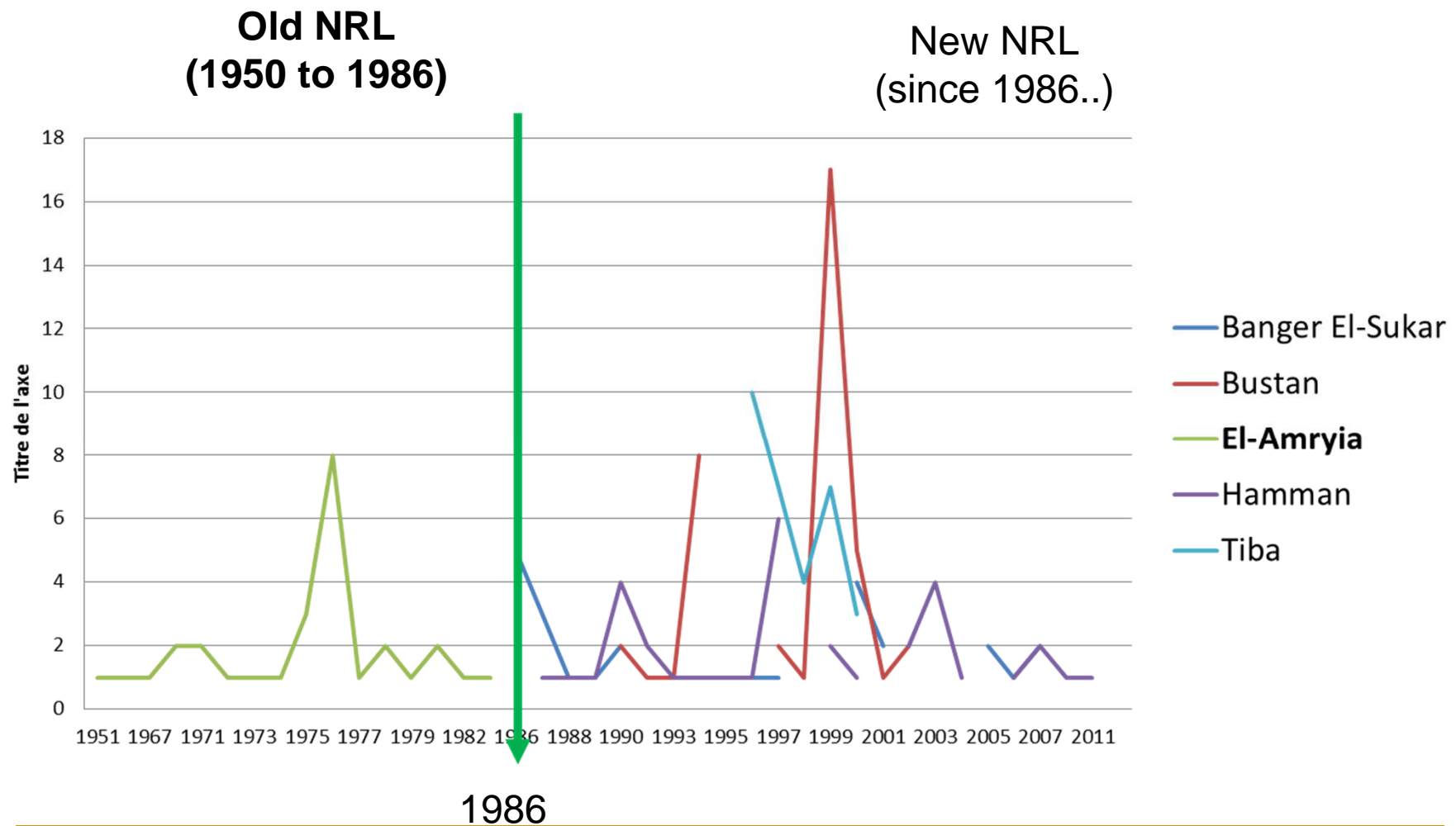**WP1: Coordination and animation**

Part 3

MAIN ACHIEVEMENTS AND PRELIMINARY RESULTS

175 family surveys done in 5 zones → 3 villages per zone
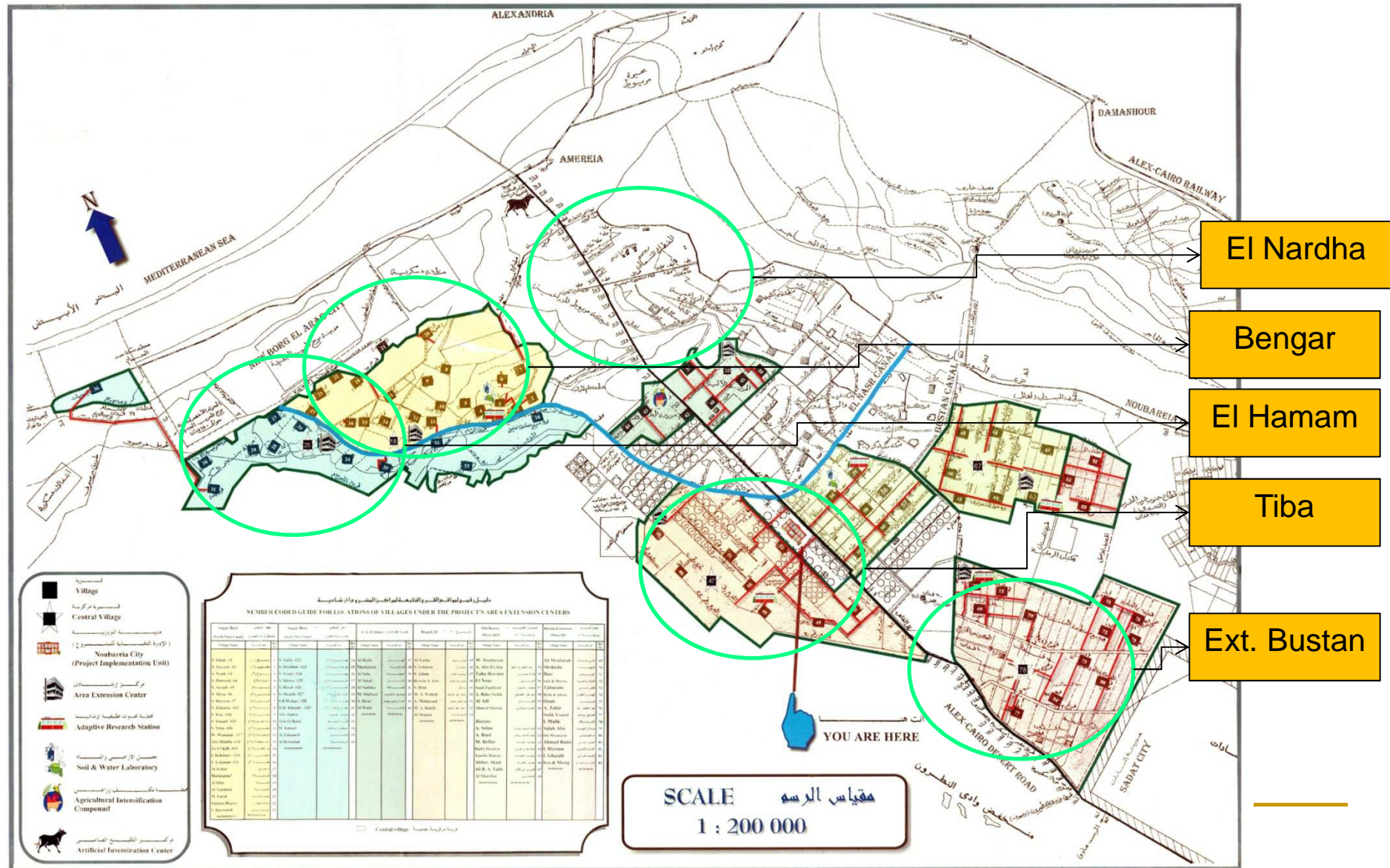
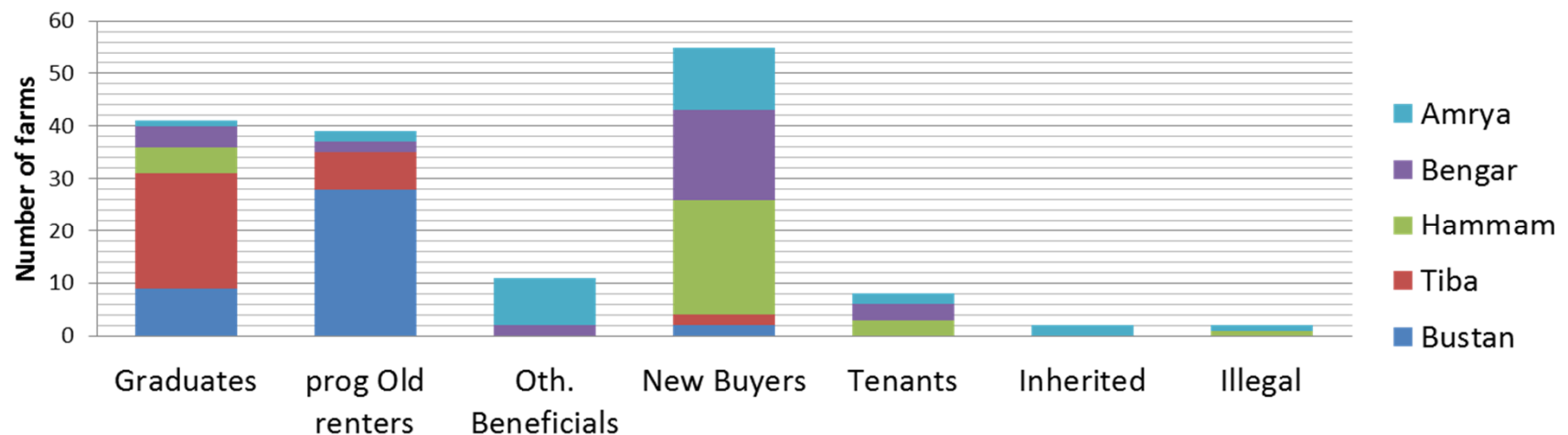# Date of land access in the New reclaimed lands

Sample distribution by district (excluded large farms)

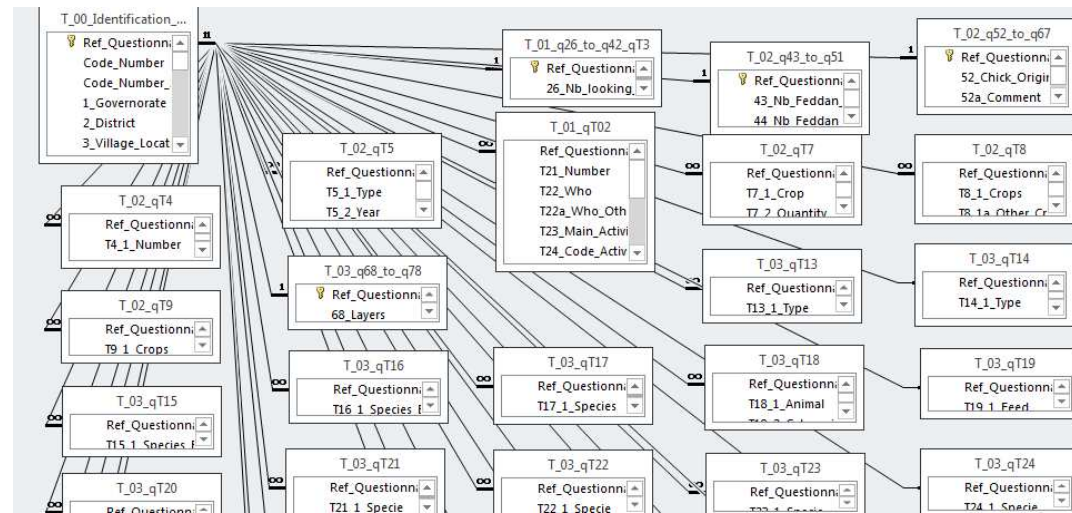| no	districts	nb families
1	Bustan	39
2	Tiba	31
3	Hamman	31
4	Banger El-Sukar	28
5	El-Amryia	29
6	Total	158

+ 17 large farms

Number of farm in each category of land access
→ representativeness of the diversity of land access

Questionnaire to Database

- **Questionnaire -20 pages
(~170 questions (simple, multi-choice, table))**

- **Database Access@Microsoft
44 tables of data
(~700 fields)**

- **Software
(entry data)**

(By Xavier)

Database ACCESS: check and validate with a systematic return in each farm

Software (forms to enter data)

Av. size of holding land by land access

Zones	Graduates	prog Old renters	Oth. Beneficials	New Buyers	Tenants	Inherited	Illegal	Av. Per zone
Bustan	5.6	3.3		2.5				**3.8**
Tiba	5.3	2.9		3.8				**4.6**
Hammam	5.0			3.2				**3.1**
Bengar	5.8	6.0	6.0	4.1				**4.1**
Amrya	12.0	2.5	4.4	4.3	4.6	6.6	8.0	**4.8**

Beneficials and graduates have increased their holding land

(By Mona)

Av. number of dairy animals

Zones	Graduates	prog Old renters	Oth. Beneficials	New Buyers	Tenants	Inherited	Illegal	Av. Per zone
Bustan	3.6	4.3		3.0				**4.0**
Tiba	1.4	2.0		0.5				**1.5**
Hammam	3.4			2.9	0.7			**2.6**
Bengar	2.5	5.5	3.5	2.9	1.3			**2.9**
Amrya	6.0	3.0	4.7	4.0	5.0	5.0	18	**4.8**

More than double of dairy animals in old NRL but also Bustan.
In Tiba, graduates don't invest or des-invest in LR to invest in fruit trees

In summary

- Two contrasted systems between « beneficials » and the « graduates » in terms of capital asset (land and livestock)→ two farming systems

    - **Fruit tree**-crop-livestock systems for « graduates »
    - **Crop-livestock** systems for « beneficials »

    → can we speak about « graduates » and « beneficials » systems?

- Important land transactions within families / communities in the village of origin

Typology (MFA Multiple factorial analysis)

(for the 158 small to medium farms)
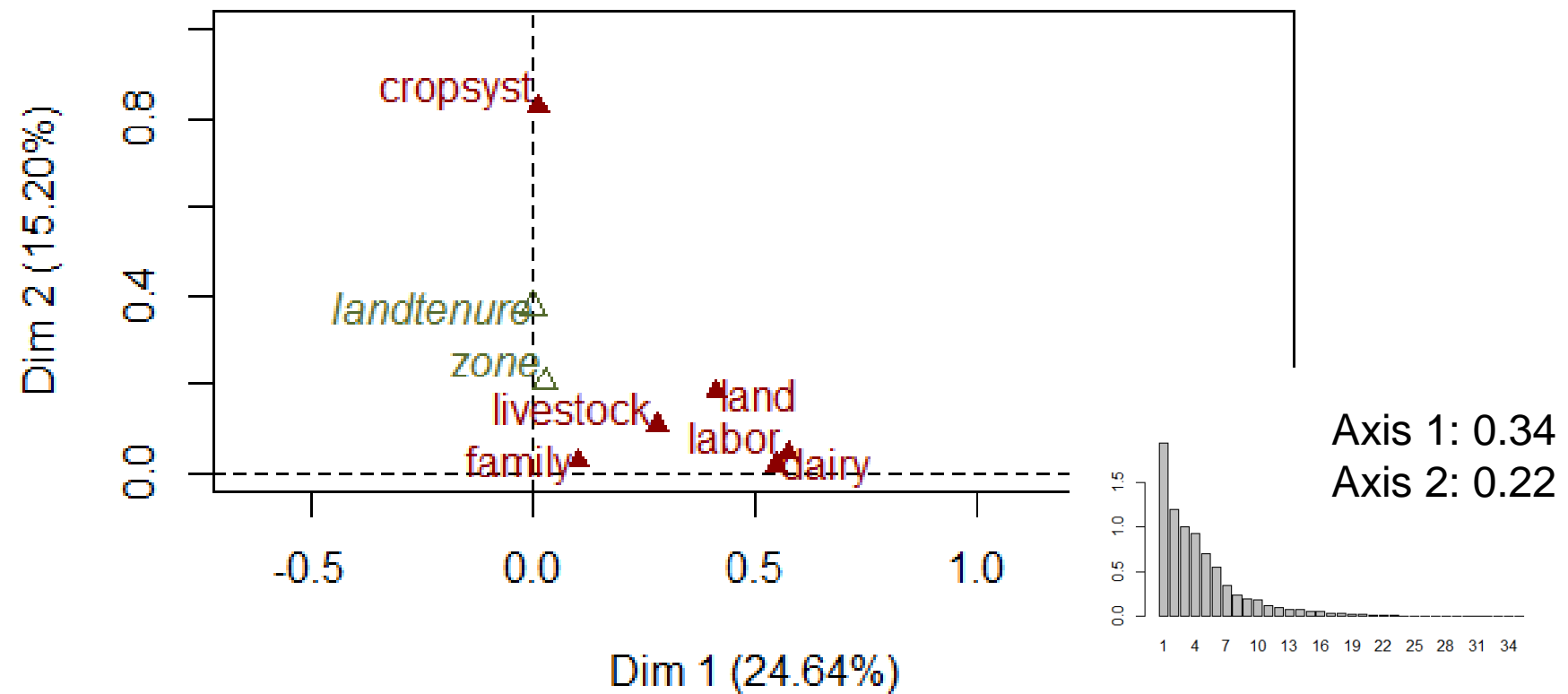
(By vero)

Typology

Gr	1	2	3	4	5
nb	**49**	**40**	**53**	9	7

Cluster Dendrogram

dist(res.mfaindcoord[, c(1, 2)])
hclust (*, "ward.D2")

Graduates oriented fruit tree

Medium to large FS oriented fruit tree-livestock

Group4:

Beneficials (Prog. Old renters) oriented crops-livestock based on family workers

New buyers-beneficials oriented crops-livestock With casual workers

El Amreya Medium to large FS oriented dairy)

d = 2
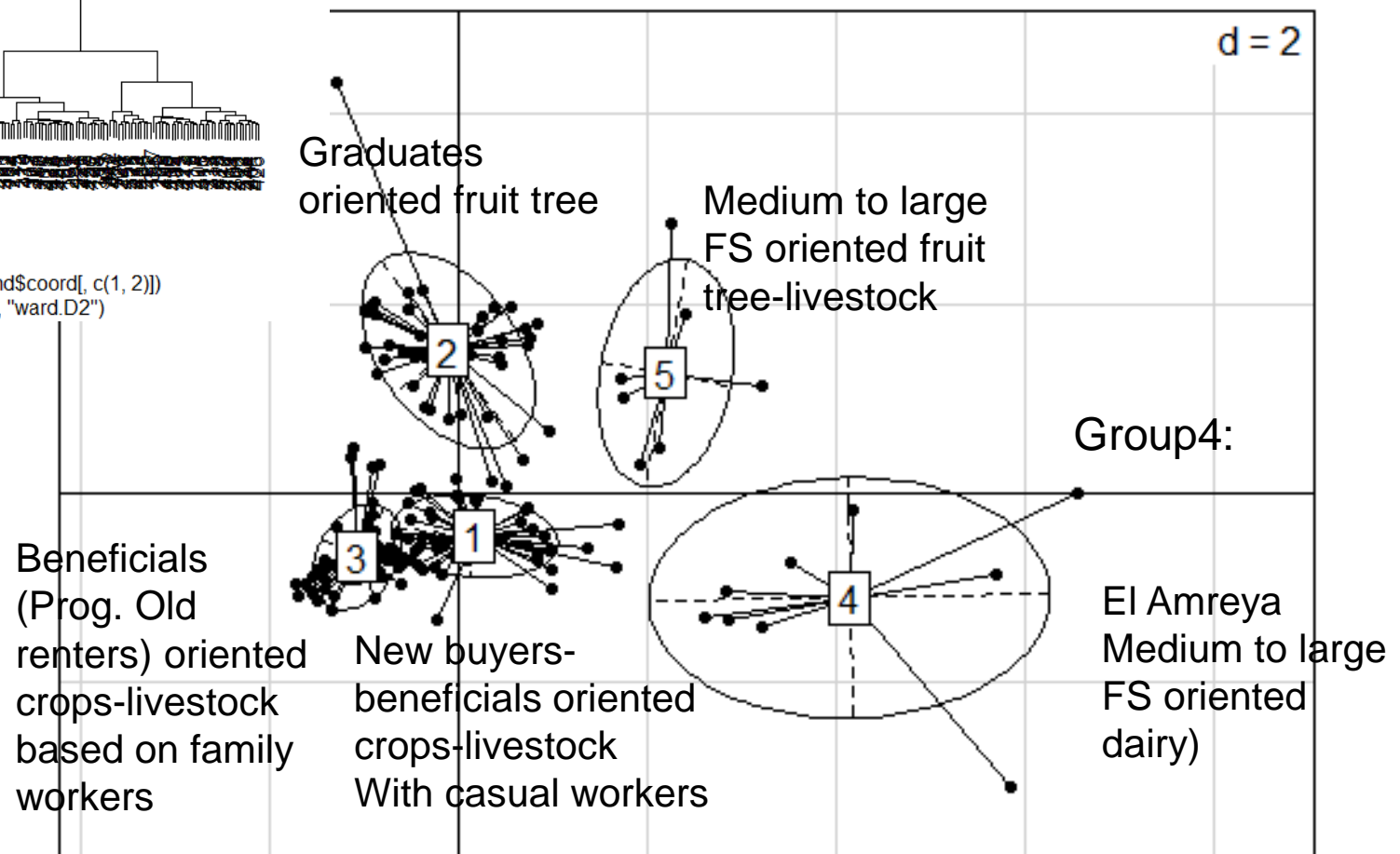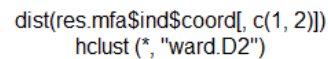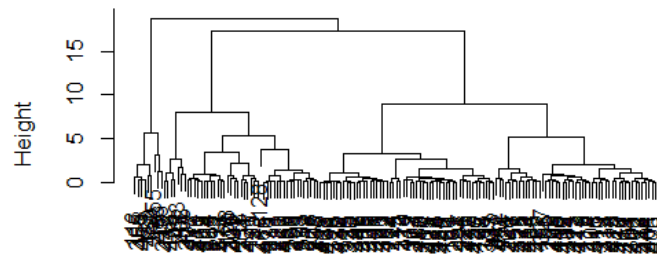
Group profiles

Variables..	3 (53)	1 (49)	2 (40)	5 (7)	4 (9)
Type	Small farms- C&L system based on family workers	Small-Medium farm- C&L system based on casual workers	Medium farm- Graduates-oriented fruit trees	Medium-large oriented fruit trees-Livestock	Medium to large farms oriented crop-livestock
Localisation	Bustan-Hammam	Bengar-Amrya-Hammam	Tiba-Bustan		El Amrya
family size	7	10	8	10	18
% casual Workers	**17%**	32%	33%	63%	36%
Total land	**2.1**	4.7	4.8	6.1	**7**
Main land access	Beneficials-New buyers	New buyers-Beneficials	Graduate	Graduates	New buyers
Crop system	annual	annual	tree	tree-annual	annual
% fodder	21%	19%	9%	13%	21%
No dairy heads	2	4	2	6	**10**
SR (no heads)	1	2	1	1	30
Milk yield/head	1070	1310	1317	1457	2593
TLU/feddan	3.27	3.46	2.62	10.09	8.48

Vulnerable profiles by types

Vulnerable profiles (158 farms) by group

Legend:
- 1-Small farms-CL-New buyers
- 2-medium farms- trees- Graduates
- 3-very small farms-CL- Beneficials
- 4-Medium farms-CL- Old NRL
- 5-medium farms- trees- Livestock-Graduates
- Mean
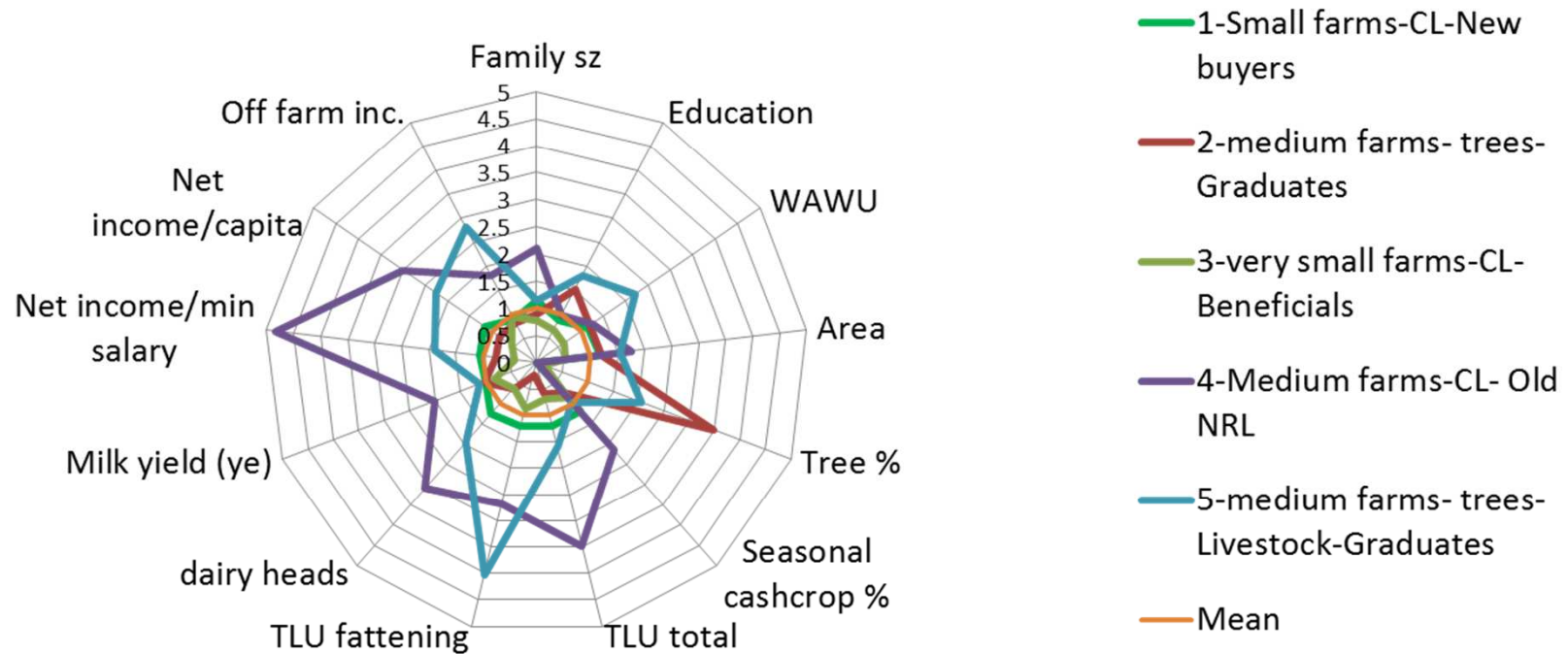
Effect of capital (land*livestock)
The most vulnerable: Very small farms, mainly recent land beneficials
➔ Time can reduce this gap? Or another context?

Vulnerable profiles by zones (158 farms)
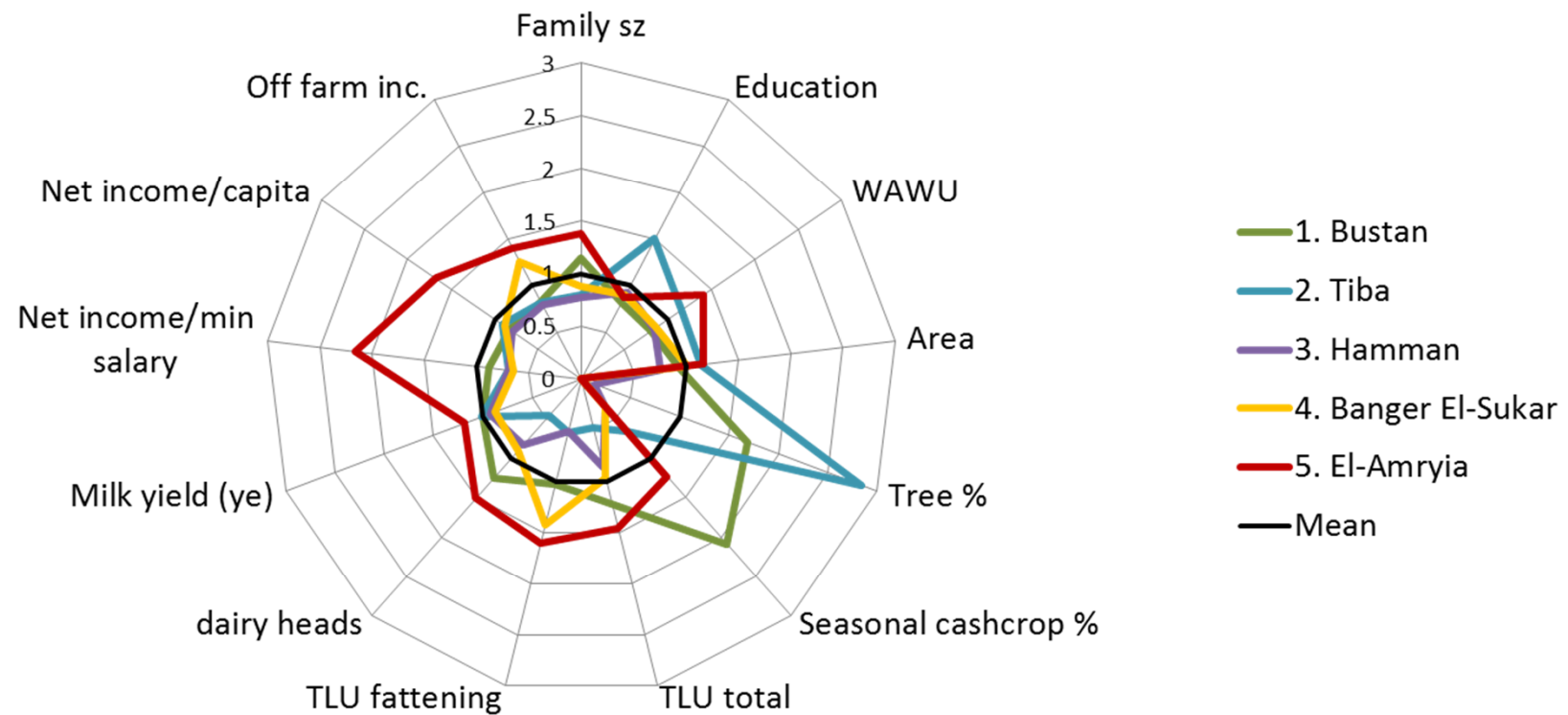
Contrast between Old NRL/ New NRL (net Income/area)
The most vulnerable zone: Hammam (water risk)

Vulnerable profiles by types (175 farms)

Vulnerable profiles including very large farms

Legend:
- 1-Small farms-CL-New buyers
- 2-medium farms- trees- Graduates
- 3-very small farms-CL- Beneficials
- 4-Medium farms-CL- Old NRL
- 5-medium farms- trees- Livestock-Graduates
- 6-Very large farms
- Mean
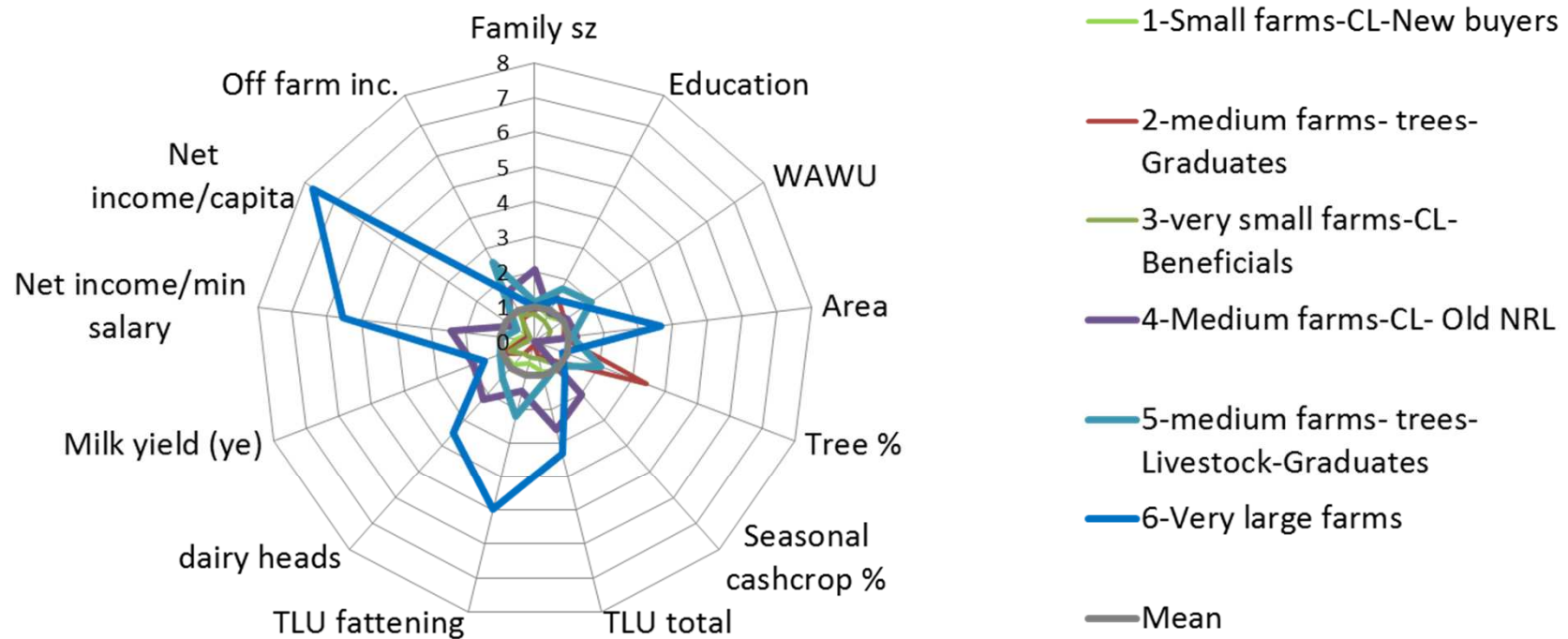
High investment in fattening for very large farmers
→ question livestock policies in Egypt

Efficiency indicators

Livestock efficiency

- Supply feed autonomy (% self produced feed cost/ total feed cost)
- Feed cost efficiency (EGP/per liter milk)
- Annual milk yield/head

Economic efficiency

- Net income per feddan
- Total Profit per family (net Income/ product)
- Livestock net income/livestock capital (for LR)
- Dairy product/ total farm product

Environmental efficiency

- Stocking rate
- Nitrogen supply from organic manure over total fertilizer

Livestock efficiency indicators (158 farmers)
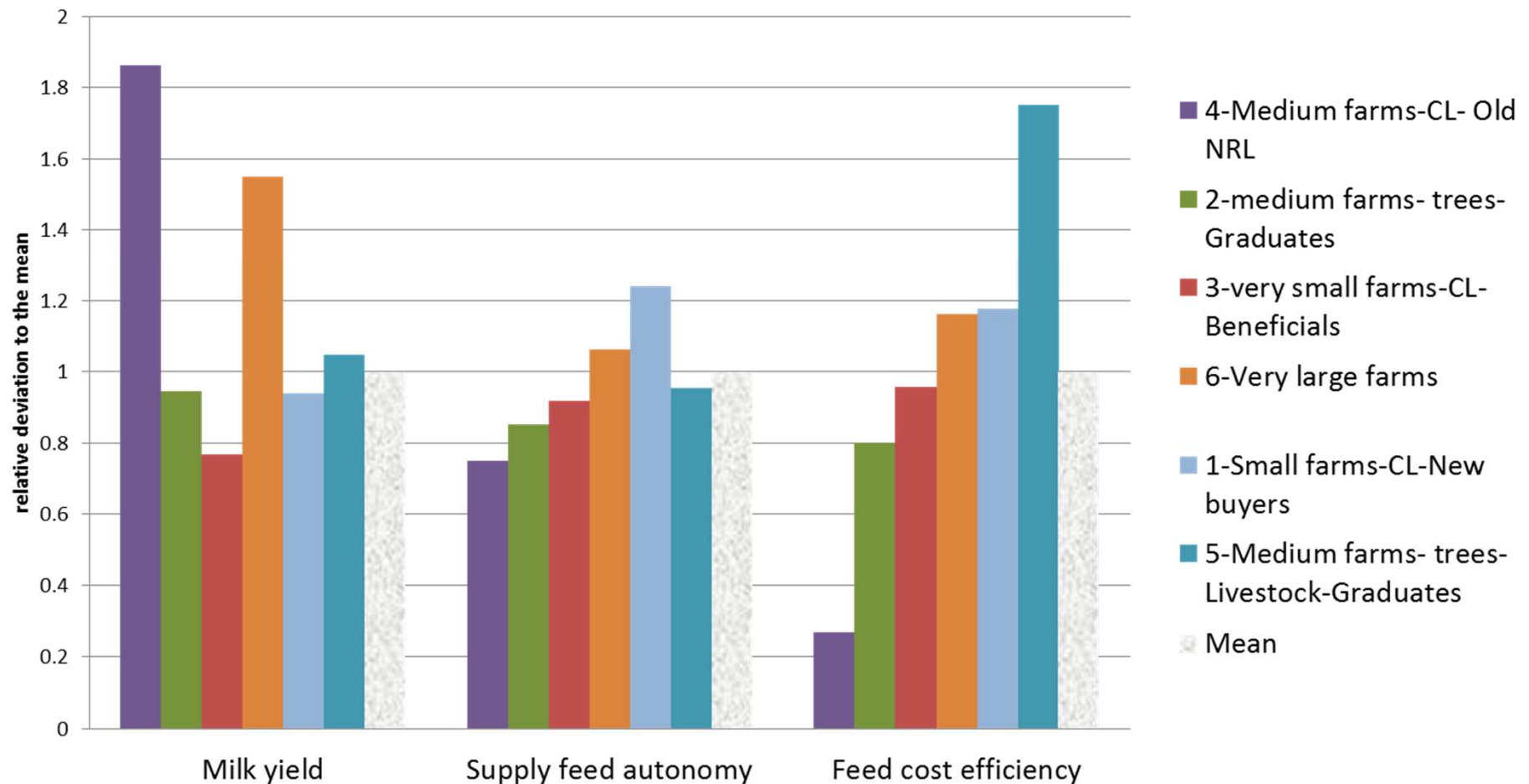
Strong link between feed cost efficiency (/ litre) and cost of self produced feed

Economic efficiency indicators (158 farmers)

Legend:
- 4-Medium farms-CL- Old NRL
- 6-Very large farms
- 5-Medium farms- trees-Livestock-Graduates
- 1-Small farms-CL-New buyers
- 3-very small farms-CL- Beneficials
- 2-medium farms- trees-Graduates
- Mean

X-axis categories: net income/fed, profit, Economic effeciency Bovine, Bov. Inc./livestock capital, dairy product %, dairy product/feddan
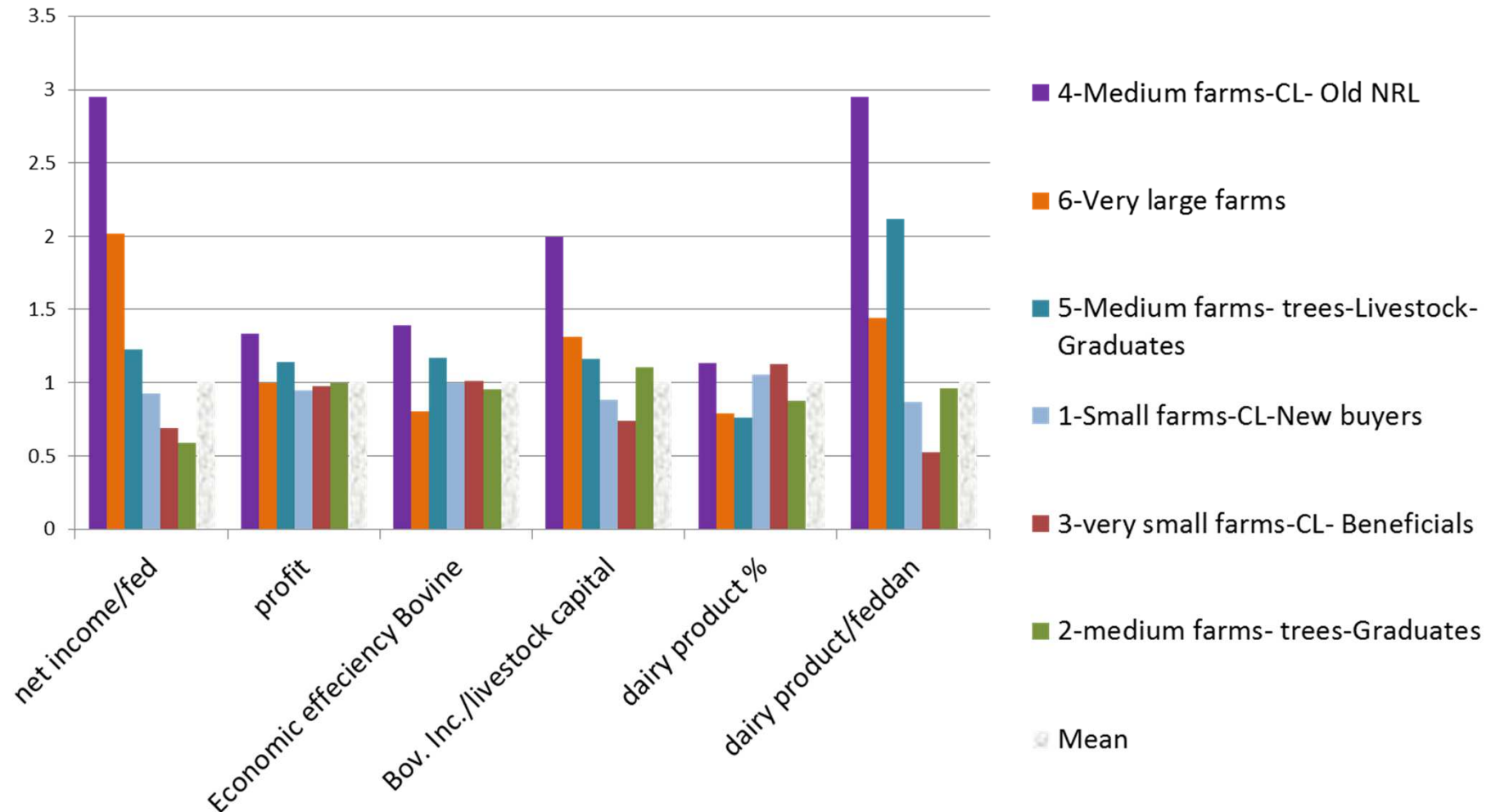
Strong link between the net income/feddan and contribution of dairy products

Efficiency (175 inc. large farmers)
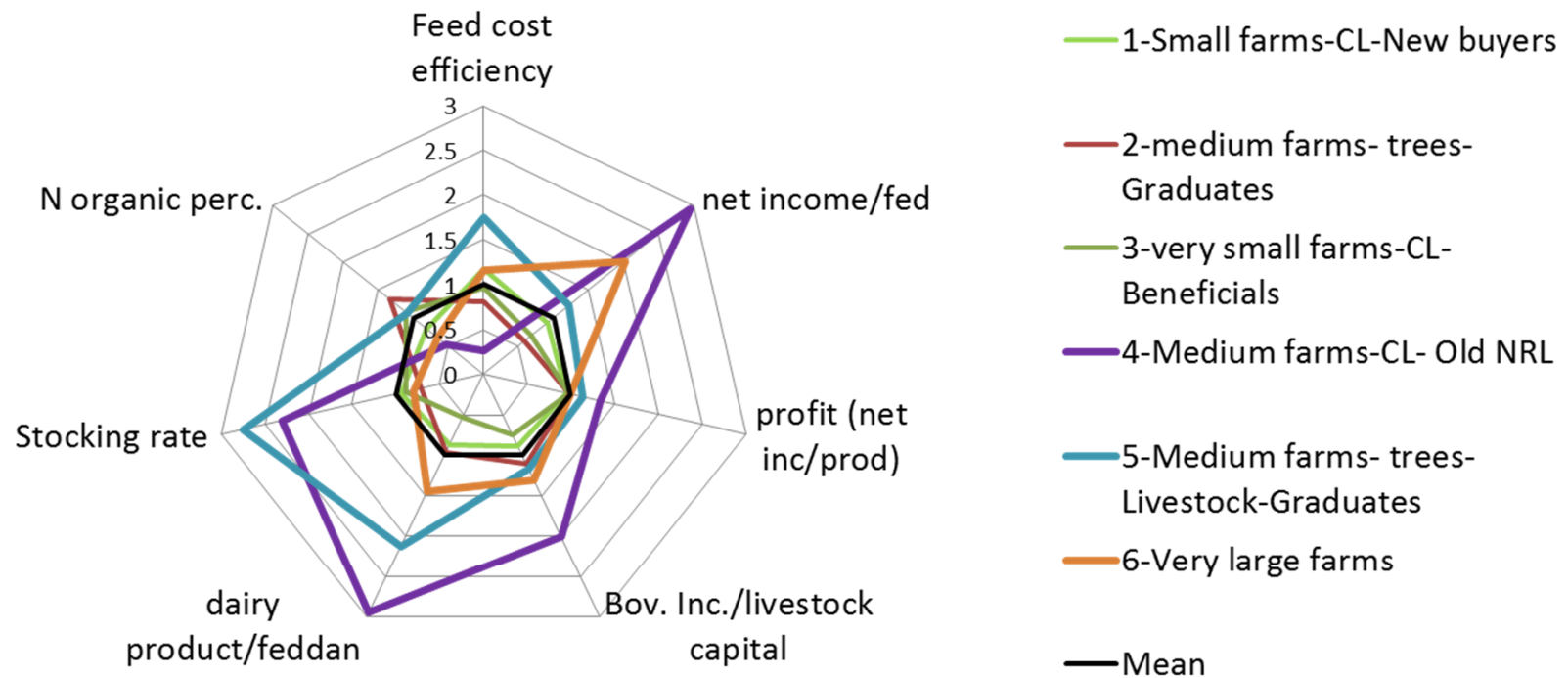
Efficiency (142 very small to medium farmers)
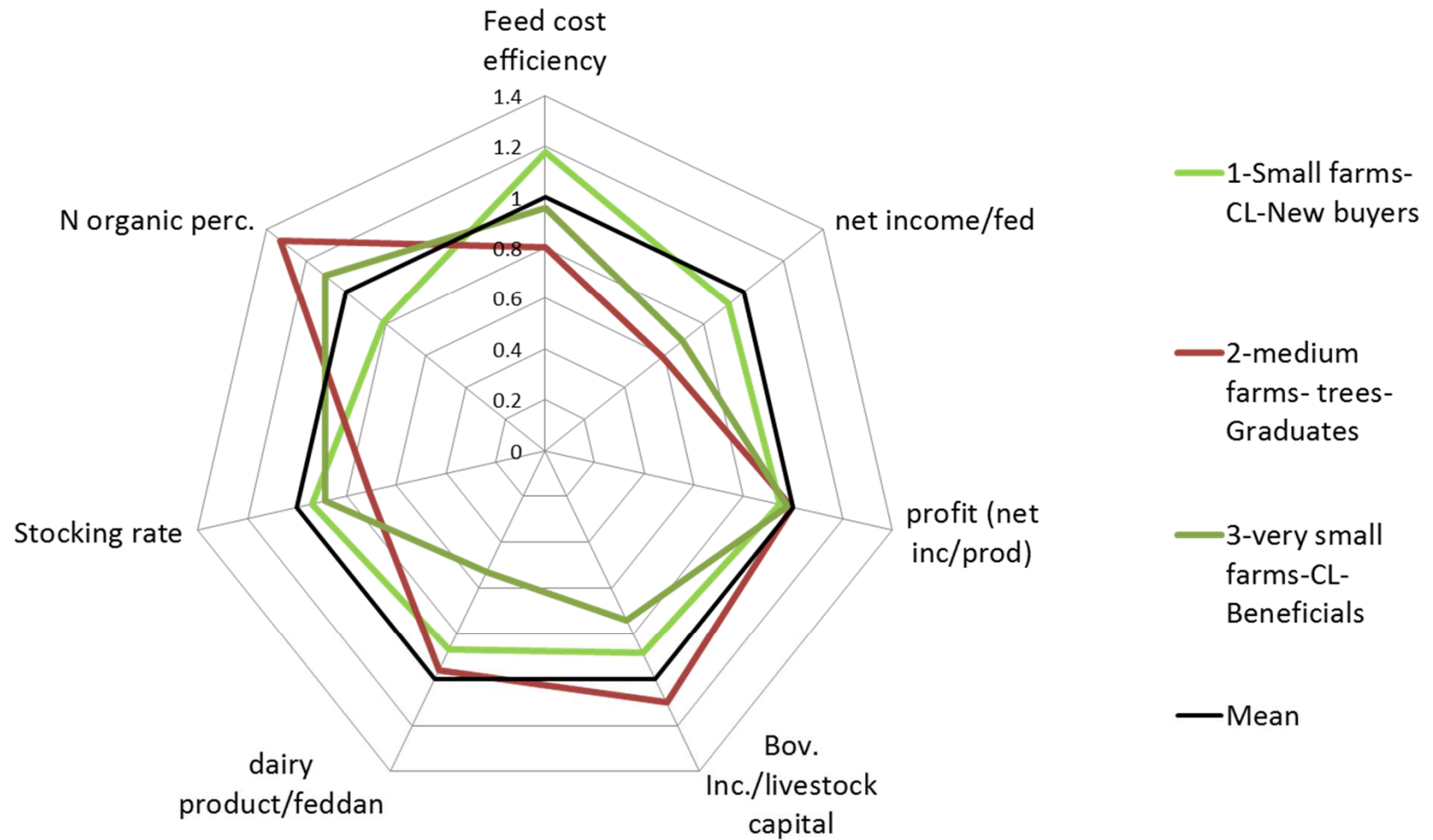
Efficiency profiles by zone
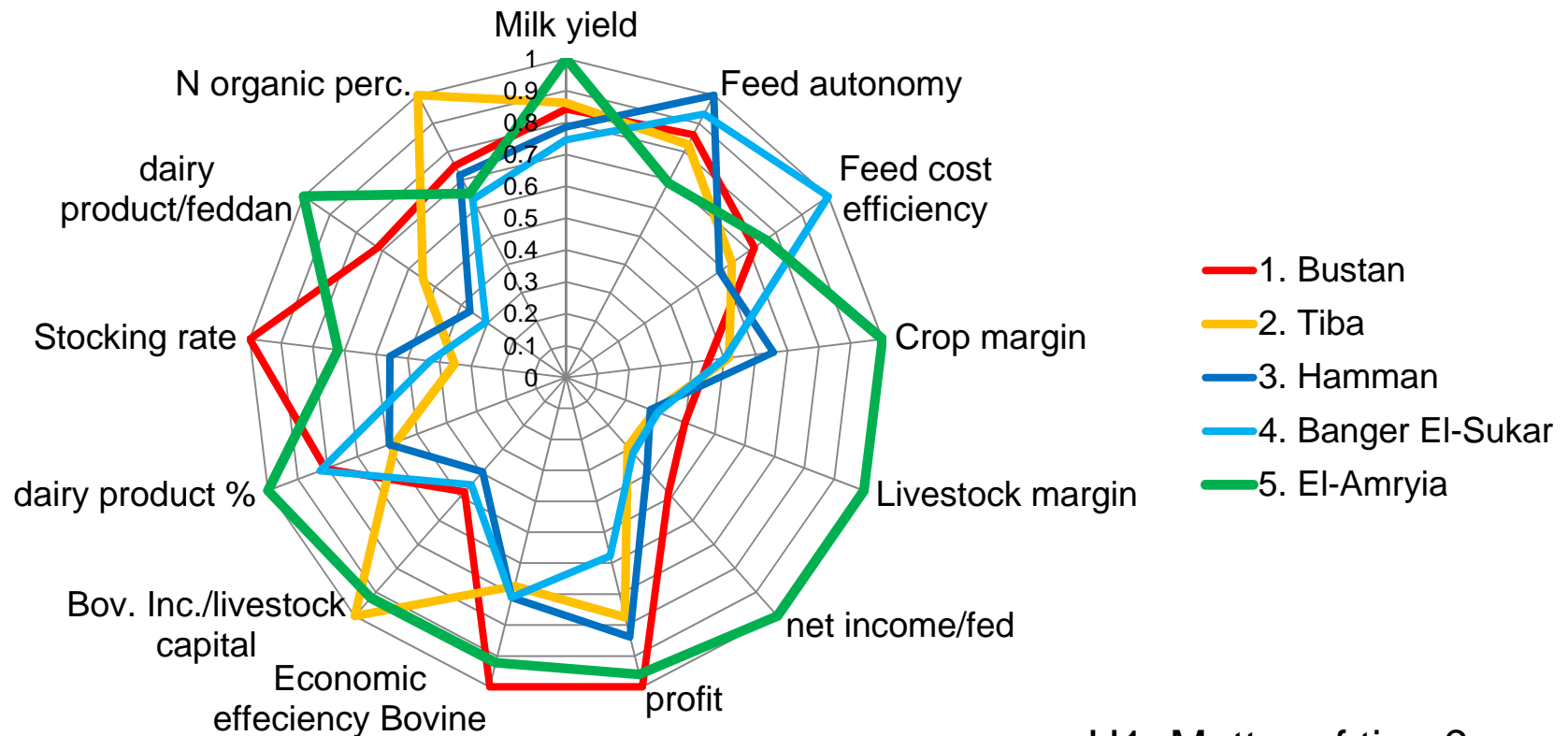
H1: Matter of time?
H2: New orientations ?

What we can say…

- Firstly need more deep analysis

- Crop&livestock system with trees→ good environmental efficiency..

- Crop&livestock system in El Hammam with a high water constraint → good feed efficiency

- Crop&livestock system on old NRL → good economic efficiency

- → index of efficiency?

What the next steps…

- Develop a qualitative analysis… → test the robustness of the typology

- Project efficiency indicators in supplementary → to well analyze the relations between farm structure and vulnerability and the efficiency

- Work on new efficiency indicators in each group technical/economic/environmental→ integrated index?

- Work on historical approach of land access and land use ressources

Follow-up approach

COMPREHENSIVE APPROACH OF FARMING SYSTEMS

(By Mona & Jean-François)

Main objectives

- Describe management practices of herd (reproduction, feeding, control of diseases, purchasing and sales of inputs and animals, …) and crops (land use, seeding, irrigation, tillage and inputs, harvesting, sales, …)

- Assess the performances of livestock and cropping systems, the diversity and the factors of this diversity

- Define the crop-livestock interactions in term of land use, inputs and products, labor, financial issues, sales, ...

- Better understand the respective functions of livestock and crop production at scale of household, family and community

- Identify the main constraints and alternatives through collected data and farmers demand

- Training of farmers, technicians and researchers

Justification

- Few data on animal and crop performances, and only based on talks of farmers, not on directly collected on fields and herds

- High diversity among the farms in term of size (small, medium and large-scale), but also regarding crop and livestock practices, and performances

- Low information about factors of this diversity, especially those related to local knowledge, land access, family workers and contract labor, availability of financial resources, …

- Weak status of extension service and development projects

- Need to have basic knowledge on local demand to define adequate policies for local development, including ones related to farmers and technicians training, extension services, farm credit, ...

- …

Implementation: Location and Frequency

- 13 farms in 3 areas/villages: Bustan, Tiba, El Nardha
- Monthly Monitoring from October 2013 to September 2014

Implementation: Basic Data on Monitored Farms

Farm N°	5	6	7	8	9	10	11	12	13	3	4	1	2
Farm code	ABD	HAM	IZA	KAR	EHA	SAM	SAI	MIS	AFI	ZEE	GAM	MAB	LAT
Zone	Nardha					Tiba				Bustan			
Settlement	78	78	Old	Old	Old	New	New	New	New	99	99	97	1
Type of farmers	Beneficiary		Graduate		Benef.	Grad.	Grad.	Grad.	Grad.	Grad.	Grad.	Benef.	Benef.
Irrigation system	Flow and Furrow					Drip & Sprinkler						Sprinkler	
Type of Soil	Limestone					Sand							
Crop land	9.5	7	30	30	8	5	5	5	5	5	5	7.5	2.5
Perennial crops land	0	0	0	0	0	2.5	2.5	5	5	5	5	0	0
Annual crop land	9.5	7	30	30	8	2.5	2.5	some alley cropping				7.5	2.5
Bovines	5	18	18	12	10	2	1	3	9	4	10	8	6
Dairy cows	2	0	6	6	4	1	1	1	1	2	3	4	2
Dairy buffalos	1	18	0	0	0	1	0	1	3	1	3	1	1
Heifers	0	0	4	3	2	0	0	0	3	0	0	0	2
Bulls -(Fattening)	0	0	2	1	2	0	0	0	0	0	2	0	0
Veals	2	0	6	2	2	0	0	1	2	1	2	3	1
Sheep & Goats	0	6	0	0	0	0	0	0	5	0	0	3	3
Poultry	Int	No	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No
Households		2	2	2	2	1	1	1	1	2	1	1	4	1
Vehicle	Car					Motocycle						No	

* Int = Intensive poultry production, Yes/No = significant backyard/Land in Feddan=0.42ha

Implementation: Cattle Identity Card

Gov: XXX Zone/Vill: Bustan/Tabarani
Farmer: Mohamed Mabrouck Eler / T1
Area: 2.5 + 2.5 + (2.5 rent)
Labor: MoMbE + wife + sons

Gov: XXX Zone/Vill: Bustan/Tabarani
Farmer: Mohamed Mabrouck Eler / T1
Area: 2.5 + 2.5 + (2.5 rent)
Labor:

Name: Black

Number: 3 (F)

Age: # Jul 2009

Mother: White / 2

Entrance: Born

Nb. Calving (2013): 3

Main production: Milk

الاسم:

عدد:

العمر:

الأم:

ملحوظة. ولادة (2013):

الإنتاج الرئيسية: الحليب

Feeding system:

Berseem ad libitum, crop residues of beans and faber beans, + concentrate (cf. Feeding balance/Youssef), June: dawara + beans residues (cf. feeding balance)

Milk production:

Oct-Nov: dry; Dec: calving; Jan:4+4(EGP4/Kg), Feb/4+4(EGP4/kg), Mar/2+2 (EP2.5/kg), June: no milking in summer => 2 months Milk for calf, 2 months for family and dry if advanced pregnancy); August: 2+2 for home consumption; Sept: 1+1: only home consumption; Drying planned in Oct-Nov

Reproduction: 3rd Calving: 10/12/13 ; 1st Mating: Feb; 2nd Mating IA 14/03; June: Pregnant 3m;

Pathology:

Exit:

نظام التغذية:

إنتاج الحليب:

الاستنساخ:

الخروج:

Implementation: Land Use & Crops (April2014)

Gov: XXX Zone/Vill: Bustan/Tabarani
Farmer: Mohamed Abdel Latif / T2
Area: 2.5 FD
Labor: Mohamed + workers
Apr14 / Date, Quantity, Price, Market, …

Gov: XXX Zone/Vill: Bustan/Tabarani
Farmer: Mohamed Abdel Latif
Area: 2.5
Labor:

1FD Berseem

Tillage: + Manure

Seeding: Sept13

Fertilizers: Nitrates 50kg/FD after cut, each 40 days

Other treatments:

Harvest: 1st = Nov13 (50-60 days after seeding) + every 40 days

½ Peanuts May-Oct14 + ½ dawara (maize forage) and 5 cuts until September. I month between berseem and dawara => just straw and concentrates (5kg, see herd monitoring)

15KR=0.70FD/Wheat

Tillage: Beginning December + Manure (?)

Seeding: 15/12/13

Fertilizers: (See Fertilizers procedure) Urea/Nitrates/Sulf, SuperP/ …

Other treatments: Urea 50kg + 5x50kg Nitrates (March and April)

Harvest: May, 3rd, 15KR =>12Ardaps # 1.8T => home consumption + Straw + Beans

15KR#0.70FD/Bean (Fasiola)

Tillage: End of January

Seeding: 7/2/14

Fertilizers: Manure (25/12/13, see pict.)

Other treatments: Urea 50kg + 5x50kg +Nitrates (March and April) + Insecticides-fungicides May, 20

Harvest: May, 14. 15KR => 800kg (EP10/kg).EP16/kg in 2013 => Libya) Bean

Implementation: Synthesis of Farm Monitoring

- 13 farms in 3 zones/villages

- Monthly monitoring giving priority to data collection quality

- Reliable data about herd (BV, BF, PR) and livestock practices:
herd genealogy, entries, exits, parturitions and abortions,
diseases, milk production, prices of inputs and animals, …

- Basic data about land use and cropping practices

- Qualitative data about production objectives and labor

Preliminary results

1. Essential role of livestock at household and family level in supplying food for home consumption (milk and meat), savings, and almost all animals for religious events.

2. High diversity of performances: yields, reproduction indices, morbidity and mortality rates, …

3. Crop-livestock integration exists but low impact on production level due to use of inputs purchased on the market (rations, fertilizers, …)

4. Complexity of crop-livestock integration because the management of herd and crops depends a lot on the objectives and strategies of farmers' families

5. Several basic rules no respected in the management of herd and crop

6. Strong dependence of the local market, especially for cash-crops led to high vulnerability of the farmers

7. Weak situation and work conditions of extension services

8. Training of farmers, researchers and technicians during one year

Complexity due to multi-functionality

- Livestock system produces
  - foods for the family (dairy products and meat), and animals for religious events
  - manure for the cropping system,
  - an significant income through the sale of dairy products and animals.
  - savings of the farmer family

- livestock is also an added value
  - to the cropping system through the valorization of the forages, crop residues and byproducts used in the feeding system.
  - to the family labor and the rural networks.

- And all these diverse functions are interacting.

Main constraints

- Distance and time for monthly monitoring, event the data quality compensates

- Diversity of performances led to differences in term of farmers' demand and research-development actions

- Improve the interest of local technicians and extension services in order to plan capacity building and farmers training

Part 4

MONITORING FOR NEW INNOVATIONS IN 2015-16

(By Samir& Xavier)

Objectives of the monitoring

- Build up a set of data on animal performances under NRL

- Assess the degree of crop& livestock integration in terms of biomass transfer (N)

- Assess the impacts of the new innovations on crop & livestock efficiency (CRP 1.1.Drylands)

LASER Monitoring : Animal-based monitoring

✓ Open and simple tool for systematic data collection (generic questionnaries, portable database, automatic routines, documentation) :
http://livtools.cirad.fr/laser

✓ Helps to deal with difficulties of demographic rates estimation :
  - Seasonality
  - between-years variation
  - confusion between probability and rate
  - competing risks

✓ Complementary approach :
    comprehensive approach → quantitative approach

✓ Can manage other data of various nature (health, cropping monitoring, …)

✓ Adoption by APRI team and sharing a common tool that can be used in other fields (Bedouin area, Morocco, Lebanon)

- **Plan of action**

  - Surveyed species: cattle, buffaloes (Xavier will add species = buffaloes in LASER database) as individuals, and sheep and goats;

  - Demography (entries, exits, parturitions and abortions) and production (milk production) ;

  - One visit bi-monthly in each farmer. Given the size of herds and the small number of events during one month, we can decrease the frequency of visits;

  - 20 farms in the monitoring in Bustan
    (10 beneficial + 10 graduate)

- **Preparation of monitoring**

  - Use adequate identification system: Leather belts (adequate length for small and large ruminants) + pre-numbered plastic tags (1-500);
  - A monitoring book by farmer and species;
  - Provide a sufficient number of pages for each questionnaire;
  - Use sheets of different colors for each questionnaires;
  - In the monitoring book, gather buffaloes and cattle and sheep and goats in the same questionnaries (common herd management);
  - Print sheets of the initial folow-up for the transfer of data to LASER monitoring during the "first" visit to farmers;
  - Protocole for measure milk production (APRI team)

- **When ? : Schedule**
  - Starting date and duration of monitoring (Mona ?)

Book of Herd: Construction

Herd   Entries   Exits   Parturitions Abortions   Milk

Book of Herd Monitoring
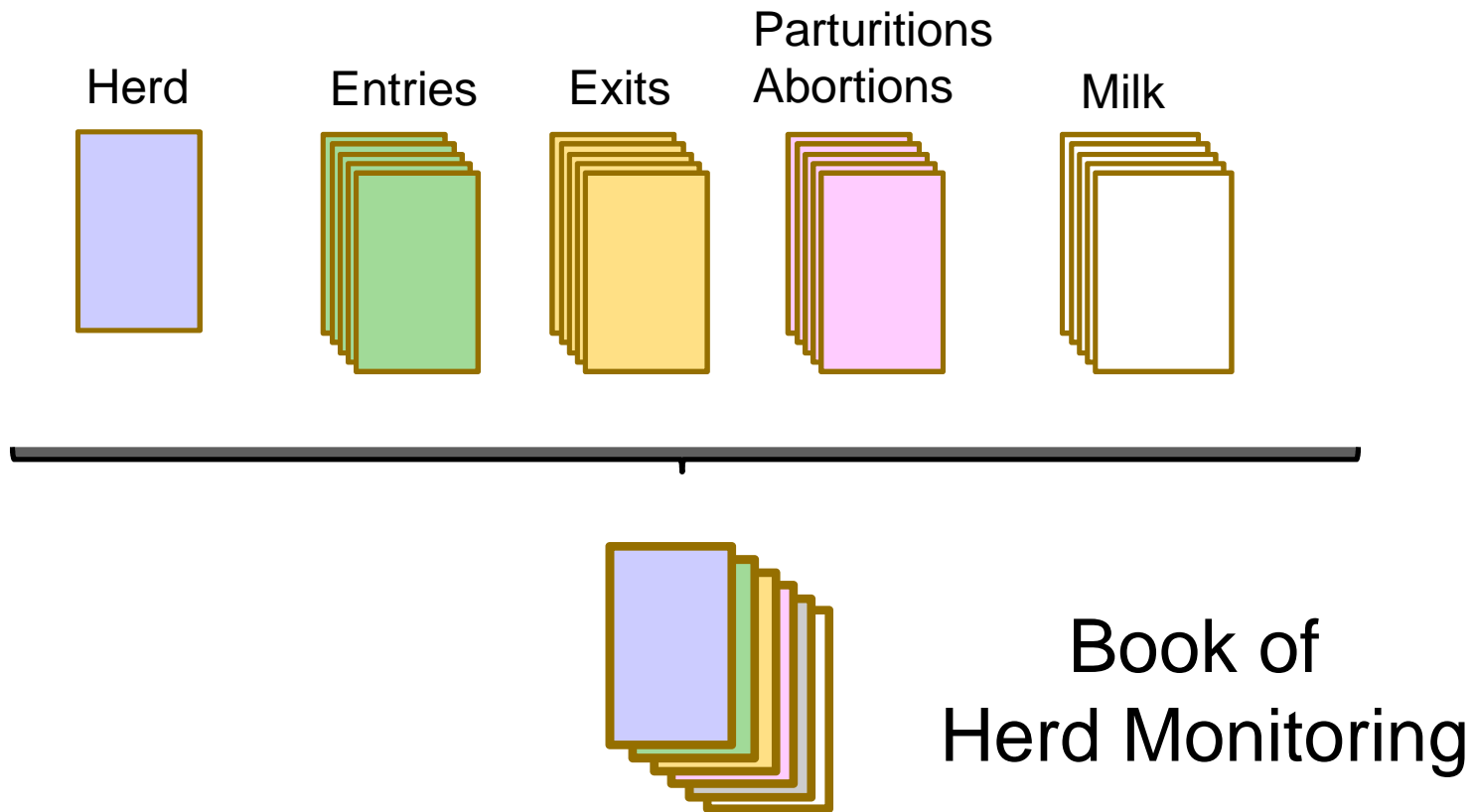
⚠️ **1 book = 1 herd of 1 specie**

Demography

Entries

ENTRIES

Herd references
IDHERD |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|
Name farmer _____ Tel. _____ ADMIN1 |__|__|__|
Species BO CA OV CM PI
Dates of visit __/__/__   __/__/__   __/__/__   __/__/__

IDANIM |__|__|__|__|__|__|__|__|__|__|__|	Date entry __/__/__
New IDANIM |__|__|__|__|__|__|__|__|__|__|__|	Type entry : BIR PUR BAR GIF
IDANIM Father |__|__|__|__|__|__|__|__|__|__|__|	ARC CBC BEG (4)
IDANIM Mother |__|__|__|__|__|__|__|__|__|__|__|	If Purchase: Price _____
Breed _____ |__|__| (1)	If Female: Parity at entry |___| (5)
Sex F / M Date birth __/__/__ (2) AI Y / N (3)	If Male: Castrated Y / N

Exits

EXITS

Herd references
IDHERD |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|
Name farmer _____ Tel. _____ ADMIN1 |__|__|__|
Species BO CA OV CM PI
Dates of visit __/__/__   __/__/__   __/__/__   __/__/__

IDANIM	Date exit	Type exit (1)	If Sale: Price	Type death (2)	Diagnostic disease (3)	Type slaughtering (4)
|__|__|__|__|__|__|__|__|__|__|__|	__/__/__	DEA SLA SAL BAR GIF DPO SBC END WIT		ACC DIS FEE GRO	|__|__|__|	ORD ACC DIS FEE UNK

Parturition and Abortions

PARTURITIONS AND ABORTIONS

Herd references
IDHERD |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|
Name farmer _____ Tel. _____ ADMIN1 |__|__|__|
Species BO CA OV CM PI
Dates of visit __/__/__   __/__/__   __/__/__   __/__/__

IDANIM |__|__|__|__|__|__|__|__|__|__|__|	If Parturition:
Date event __/__/__	Nb. born alive |___| Nb. stillborn |___|
Type event PAR / ABO (1) Rang |___| (2)	Condition of parturition EAS EAA DIF CAE EMB (3)

Production

Milk production

MILK PRODUCTION

Herd references
IDHERD |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|
Name farmer _____ Tel. _____ ADMIN1 |__|__|__|
Species BO CA OV CM PI
Dates of visit __/__/__   __/__/__   __/__/__

IDANIM	Date measure	Type de measure (1)	Value	Type agent (2)
|__|__|__|__|__|__|__|__|__|__|__|	__/__/__	MOR EVE DAY PRT BUT CEL	_____	|__|__|__|

Software LASER (1/2)

Filename database

Software version

DB_Training_BAIF.accdb - LASER 2 (Sept28.2014)

FICHIER MAIN OPTIONS Connexion

New Open Properties Backup | Herd Animal | About LASER

Database | Data entry | Check | View | Quit

Entry new data
Modify data

Check integrity

View data by herd
or by animal

Software LASER (2/2)

Integrative approach of the crop-livestock system

Feeding system

Category of animals (Specie)	Physiological stage	Nb heads	Unit	Quantity (Number of units) Yesterday morning	Quantity (Number of units) Yesterday evening	Total (Number of units) 1 day Yesterday

Biomass

Plot Number	Crops	How many sample	Area of sample (meter)	Fresh weight (kg)	Dry weight
		–	–	–	–
		–	–	–	–
		–	–	–	–

Cropping system

Surface et sol	events	Plot 1. Crop : _____		Plot 2 Crop : _____		Plot 3 Crop : _____	
Operations	Variables	Technique	Cost	Technique	Cost	Technique	Cost
Spraying organic manure	Quantity (carts)						
	period						
	origin						
Ploughing (land preparation)	Tractor hours						
	Date (week)						
Seed	Date of seedling						
	Quantity						
	Source?						
Herbicides + pesticide n°1	Name						
	Quantity						
	date						
Herbicides + pesticide n°2	Name						
	Quantity						
	date						
Chemical fertilizer n°1	Name						
	Quantity						
	date						
Chemical fertilizer n°2	Name						
	Quantity						
	date						
Chemical fertilizer n°3	Name						
	Quantity						
	date						
Harvesting (main products)	Production						
	Sold quantity						
	Where sold? Why?						
Harvesting (by-products)	Production						
	Sold quantity						
	Where sold? Why?						
grazing (green fodder; crop residues)	No heads						
	period						
	No days						
	Contrat (Y/N)						
Post harvesting operations and by products	Type of products						
	quantity						
	% sold						
	price						

Part 5

PLANNED ACTIVITIES FOR 2015-16

(By Adel)

Planned activities

- Monitoring → for innovation

- Value chain approach for dairy products crossed with territorial approach

- Complete data analysis on family surveys
  - → lessons learned for future <u>Mega National Project for Land Reclamation</u>

- Hope to have crossed countries activities on socio-ecological sustainability

Links

- CRP1.1- Drylands on Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas
- Project ELVulmed (ANR CEP&S) on the role of livestock in reducing vulnerability
- Project SIADEEP 'Danone Ecosystem' on dairy chains and community/territory approach
- Project Imhotep Climed-Egypt (capacity building)
- Projet AIRD-STDF on *Collective action and agricultural productivity in Egypt's New Lands (Organic manure)*
- *New Links: H2020*