Milk quality improvement through training and interventions: Experience sharing from NWO ARF project

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#### Contents

- Wageningen University and Research
- the NWO ARF project Healthy cows, healthy food, healthy environment
- Veterinary Drug and Feed Administration and Control Authority (VDFACA QC) quality control laboratory
- Training in Wageningen
- Results of testing in Ethiopia



#### Two partners

#### Wageningen University & Wageningen Research





#### Our institutes

- Wageningen Bioveterinary Research
- Wageningen Centre for Development Innovation
- Wageningen Economic Research
- Wageningen Environmental Research
- Wageningen Food & Biobased Research
- Wageningen Food Safety Research (RIKILT)
- Wageningen Livestock Research
- Wageningen Marine Research
- Wageningen Plant Research





# NWO ARF project

- Applied Research project "Healthy Cows Healthy Food -Healthy Environment: Enhancing safety and quality of milk in Ethiopia
- Partners: ESAP, Dutch Farm Experience, RIKILT
- This project focuses on methodologies to reduce the use of antibiotics in dairy farming by applying the Natural Livestock Farming 5-layered strategy





#### Interventions NWO ARF project

- Use of herbal remedies for cattle disease (thanks to training from prof. Nair and Punniamurty from India and dr. Taffese Mesfin from Ethiopia)
- Improved cow management (thanks to dr Jan van der Zee and Hanneke Hansma on calf management)
- Control of milk quality and safety (VDFACA)

Enhancing safety and quality of milk in Ethiopia

Research projects / ARF Projects / ARF-3.2 Enhancing safety and quality of milk in Ethiopia





### Evaluation of problems of dairy farmers

- Meeting in Ethiopia with farmers
- Wheel system with dr. Katrien van 't Hooft
- https://www.dutchfarmexperience.com/dairy-wheel/







# Ethiopian partner



- Veterinary Drug and Feed Administration and Control Authority (VDFACA QC) quality control laboratory
- Training of trainers for milk quality control
- 29 October 3 November 2018
- Focus of the training was primarily on
- Total bacterial count (TMC) according to ISO 4833
- Somatic cell count (SCC) according to ISO 13366
- Antibiotic residues using Delvotest, and follow up with lateral flow
- Aflatoxins





### Laboratory training at WFSR

- VDFACA QC laboratory is one of a key partner of WFSR-ESAP joint project
- The following major activities were accomplished during the laboratory work preparatory phase
- Training administration to six VDFACA QC lab personnel at WFSR, Netherlands
- VDFACA QC lab in-kind contributions (manpower & laboratory supplies) identification and notification to the WFSR







### Training at WFSR

- Aim: Establishing baseline data on milk quality and residues of project farmers
- Assess the effects of interventions in the project









- Laboratory test material procurement needs/gaps identified, reviewed & submitted to WFSR
- Milk sample collection and different milk quality & safety lab testing procedures were prepared or developed and make ready for use.
- Laboratory materials donation per-requist information were collected from relevant government organization including VDFACA head office and Ethiopian Custom Authority and the information was communicated to RIKILT to facilitate laboratory supplies shipment.





- First round procured lab supply consignment custom clearance process was facilitated and delivery of the materials was secured.
- Electronic communication was regularly maintained with RIKILT and clarification responses and documents were timely notified to RIKILT.



### Challenges

- First round lab supplies /consignment /custom clearance process and delivery time was delayed due to lack of budget/custom duty fee. This problem was finally solved by ESAP.
- Some very important laboratory supplies did not arrive yet.
- Because the remaining laboratory materials shipment process has been encountered unforeseen problem and therefore, milk quality laboratory testing activities were not implemented and practiced properly as per the laid project time frame.



### **Residues antibiotics**

#### 5. Cow milk antibiotic residue screening test result summary

		Sample		Antibiotic screening test results						
S/N	Sample		Total sample	Tri	ive	Delvotest				
	concetion place	type	resteu	B-lactum	ттс	Sulfa drugs	positive			
1	Bishoftu town	Raw milk	60	17 (28.3%)	1 (1.6%)	1 (1.6%)	20 (33.3%)			
2	Sululta town	Raw milk	102	14 (13.7%)	7 (6. <mark>8%)</mark>	0 (0%)	18 (17.64%)			
	Sub total		162	31 (19.14%)	8 (4.94%)	1 (0.62%)	38 (23.46%)			
3	Asella town	Raw milk	99	*		*	6 (6.06%)			
4	Addis Ababa	Pasteurized	100	*		*	4 (4%)			
	Sub total		199	*	* * *		10 (5.03%)			
8	Delvotest pos	itives total	361	(38	(38+10)/ (162+ 199) X 100%					

(\*): Samples not tested for trisensor



# Results of testing

#### Cow raw milk microbiological quality assessment data

#### Sample collection place: Durame town, South Ethiopia

C/N	Sample code No	Pathogen bacteria isolation (N=59)						
5/11	Sample code No	E.coli	Salmonella	Staph.aureus				
	Total positive	15	1	40				
	Positive (%)	25.42	1.69	67.80				
	Remarks:	0 & 1 indicates negative and positive test results, respectively.						

#### Enhancing safety and quality of milk in Ethiopia (November- December 2019)

#### Table 1: Total Bacterial Count (TBC) & Pathogen Bacteria Isolation Test Results

CN	Sample	ample Total Bacteria de No Count CFU/ml	Milk Grades (N=50)				Pathogen Bacteria Isolation (N=60)			
5/IN	code No		Very good	Good	Bad	Very bad	E.coli	Salmonella	Staph.aureus	
L	Tota	1	21/50	12/50	5/50	12/50	7/60	1/60	28/60	
Percent			42%	24%	10%	24%	11.67%	1.67%	46.67%	



### Safety

#### Healthy Cows, Health Food, Healthy Environment: Enhancing safety and quality of milk in Ethiopia with a focus on antibiotic residues

S/ N	Test parameters	Total sample tested	Fit	Unfit
1	Total Bacterial Count (TBC)	50	33 (66.00%)	17 (34.00%)
2	Pathogen Bacteria Isolation	60	52 (86.67%)	8 (13.33%)
3	Somatic Cell Count (SCC)	44	22 (50.00%)	22 (50.00%)
4	Aflatoxin M1 (AFM1)	60	47 (78.33%)	13 (21.67%)
5	Milk Proximate Analysis	60	35 (58.33%)	25 (41.67%)
6	Antibiotic Residue Screening Test	60	40 (66.67%)	20 (33.33%)

#### Table 1: Overall milk quality and safety test result summary data



#### Interpretation

#### **Table 2: Test result interpretations**

S/N	Test parameters	Fit	Unfit
1	Total Bacterial Count (CFU/mL)	≤ <b>1,000,000</b>	> 1,000,000
2	Pathogen Bacteria (Salmonella & E.coli)	Absent	Present
3	Somatic Cell Count (Cell/mL)	$\leq$ 1,000,000	>1,000,000
4	Aflatoxin M1 (µg/kg)	$\leq 0.5$	> 0.5
5	Milk Proximate Fitness	Within acceptable limit	Out of acceptable limit
6	Antibiotic Residue Screening (mg/kg)	Antibiotic negative	Antibiotic positive



### Total bacterial count

#### Table 3: Total Bacterial Count (TBC) test result summary

S/N	Bacteriological grade	Total bacterial count	Test results	(N=50)		
	Bacteriological grade	(CFU/mL)	Samples	%	References	
1	Very good	0 - 200,000	21/50	42		
2	Good	200,000 - 1,000,000	12/50	24	ES ISO 4833-1:2015	
3	Bad	1,000,000 - 2,000,000	5/50	10	ES 3460:2009	
4	Very bad	2,000,000 & over	12/50	24	1	

Interpretation: Samples with (Very good + Good) results considered as Fit whereas (Very bad + Bad) considered as Unfit



### Resistance data

		AST measurement (mm)		Pathogen bacteria isolates & their AST/AMR status										
S/N	Antibiotic discs used	break point interpretations			Staph.aureus (28)		E.coli (7)		7)	Salmonella (1)		Total		
		S	MS	R	S	MS	R	S	MS	R	S	MS	R	-
1	Gentamycin 10µg	≥15	13-14	≤12	27	0	1	6	1	0	1	0	0	36
2	Streptomycin 10µg	≥15	13-14	≤12	27	1	0	5	0	2	1	0	0	36
3	Amoxicillin 20µg	≥18	14-17	≤13	9	8	11	5	1	1	0	1	0	36
4	Tetracycline 30µg	≥19	15-18	≤14	14	1	13	3	1	3	0	1	0	36
5	Trim+sulfamethoxazole 25 µg	≥26	23-25	≤22	15	5	8	5	0	2	1	0	0	36
	Average result		<i>1</i> )		18.4	3	6.6	4.8	0.6	1.6	0.6	0.4	0	36

#### WFSR-ESAP Project milk sample AST/AMR assessment report: Tips

Remarks (S: Susceptible; MS: Moderate Susceptible; R: Resistant)

Five locally available antibiotic discs were purchased and used for Antimicrobial Susceptibility Test (AST) or Antimicrobial Resistant (AMR) assessment against the identified bacteria. This data may provide you some insights about the project milk antibiotic residue and its AST/AMR associations. Break point interpretation of each antibiotic disc is based on the **CLSI** (Clinical and Laboratory Standards Institute Antimicrobial Susceptibility Testing Standards Vol. 30 No. 1 and Vol. 30 No. 15) guidelines and each measurement is in millimeter (mm). You can draw AST/AMR status conclusions of each antibiotic discs against the general or specific bacterial isolate indicated in the table above.



# Milk quality data

	NWO ARF				Control samples					
	maximum	Minimum	<mark>Average</mark>	Within limit	maximum	Minimum	<mark>Average</mark>	Within limit		
Fat min. 3,5 %	7.18	0.94	<mark>2.91</mark>	16/60	6.60	0.2	<mark>2.74</mark>	13/59		
Solid not fat min. 8,5 %	10.43	6.80	<mark>8.92</mark>	47/60	10.73	2.38	7.86	25/60		
Protein min. 3,2 %	4.02	2.48	3.31	40/60	3.97	0.79	2.89	22/60		
Lactose min. 4,2 %	5.88	3.64	<mark>4.86</mark>	56/60	5.81	1.17	<mark>4.24</mark>	19/60		
Density at 15.6 25°C. 1.026- 1.032	1.034	1.020	1.027	41/60	1.0312	1.0063	1.0232	33/60		
Freezing point -0.550 to - 0.525	-0.264	-0.614	<mark>-0.046</mark>	8/60	-0.304	-0.558	0.449	6/60		
Minerals 0.7-0.9 %	1.2	0.0	0.6	40/60	0.9	0.32	0.65	27/60		



### Pathogenic bacteria

#### Table 1. Comparison NWO-ARF milk data on pathogen bacteria isolation test results

	n	E.Coli	Salmonella	Staph Aureus
NWO/ARF	60	11,67 %	1, 67 %	46,67 %
Reference data	59	25,42 %	1, 69 %	67,80 %

Better quality of milk concerning pathogenic bacteria





### Summary

- At *laboratory* level, the capacity and skills on milk (product) quality analysis of laboratory personnel was strengthened, after which the milk quality and status of antibiotic residues in milk from community members was determined.
- This showed that the level of antibiotic residues in the pilot communities was substantially lower than in other communities with similar (zero-grazing) dairy system around Addis Ababa.
- Moreover other data showed that the milk production was enhanced



#### Conclusion

- 5 layer system worked
- Feedback on milk quality helps farmers to improve
- Herbal remedies enhanced animal health
- Also calf and cow management supported animal health
- Reduced need for antibiotics
- Quality control system proved its value





# Thank you for your attention!

To explore the potential of nature to improve the quality of life

