

# Farmers preference for bundled input-output markets: Implications for adapting dairy market hubs in the Tanzania dairy value chain

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# Introduction

- ❑ Smallholder systems perverse with limited market participation
- ❑ More so in many agricultural sub-sectors across SSA countries
- ❑ Situations in Tanzania not different – the dairy sector
  - ❑ Milk supply demand gap - low productivity versus increasing demand
  - ❑ Low productivity attributed to limited market orientation among producers (*Luoga et al., 2014; Njombe et al., 2011*).
- ❑ Hence the renewed effort to enhance market orientation via
  - ❑ Collective action – economies of scale & reduced transaction cost

# Introduction

- ❑ Yet traditional approaches, e.g., cooperatives limit economic viability (*Francesconi and Wouterse, 2015; Mujawamariya et al., 2013*)
  - ❑ Heavy social orientation
  - ❑ Lack of collective entrepreneurship
- ❑ Hence the need for more flexible mechanisms such as Dairy Business Hubs (DBHs)

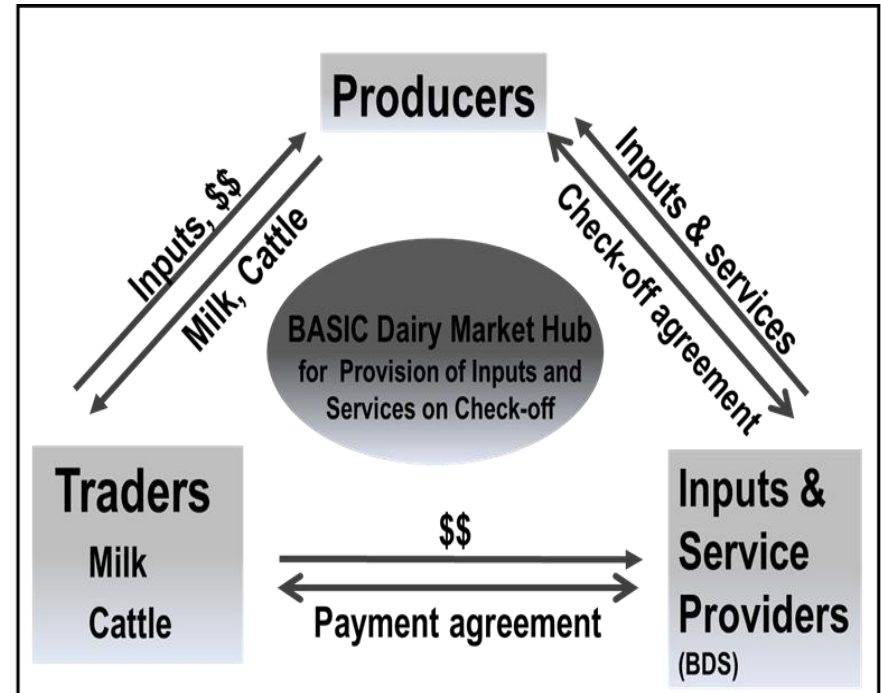
# Introduction

A hub is a mechanism for upgrading the value chain by:

- ❑ Clustering services around output buyer
- ❑ Contracts that bundle output-input/service provision

A hub brings more business orientation – bundling new attributes with milk marketing

- ❑ Provision of inputs & services
- ❑ Payment of services via check-off, etc.



Existing arrangements such as cooperatives have certain attributes

- ❑ Output (milk) bulking
- ❑ Welfare services, e.g., credit

However success of hubs depend on

- ❑ The match between proposed hub solutions and farmer needs

# Understanding farmers' preferences

- ❑ We therefore need to know what attributes farmers prefer in order to develop hub models that would interest them
- ❑ We also need to understand why certain “presumably” important attributes may not be preferred
- ❑ We therefore conducted a choice experiment to answer some of these questions

**Table 1: Illustration of attributes and their levels**

Attributes	Attribute levels			
	1	2	3	4
<b>Milk price (TZS)</b>	600	800	1000	
<b>Payment for milk</b>	Cash on delivery	Fortnightly	Monthly	
<b>Input/service provision</b>	Inputs (feeds, drugs etc.)	Services (AI, Animal health)	Credit	Extension/training
<b>Payment for services &amp; inputs</b>	Cash	Credit	Check-off	

# The Choice Experiment

- Each respondent presented with a series of choice sets/cards as below
- Respondent asked to choose the most and least preferred option
- Choice influenced by attributes levels in each choice alternative
- Choice sets/cards with different attribute arrangements presented to respondents 12 times
- With repetition we can assess the importance of the attributes and their respective levels and farmers' willingness to pay/forego

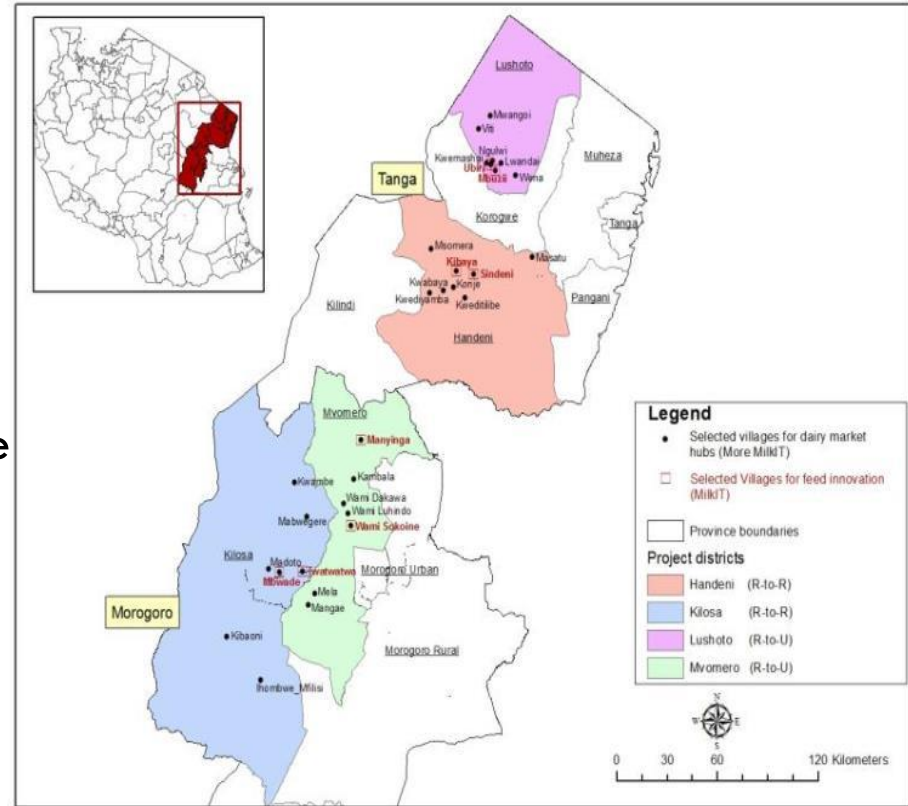
**Please indicate the most and least preferred milk sales and services provision arrangements**

(Tick only one case in each line)

Attribute	Choice 1	Choice 2	Choice 3
Milk price	1000 TSH/L	800 TSH/L	600 TSH/L
Payment of milk	Fortnightly	Cash on delivery	Monthly
Input/service provision	Inputs	Services	Credit
Payment for inputs/services	Credit without check-off	Cash	Check-off
<i>Most preferred</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Least preferred</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Project Site

- ❑ Data collected from 461 respondents
- ❑ Project sites with varying conditions
- ❑ Lushoto predominantly intensive systems
  - ❑ More high-grade cattle
  - ❑ Mostly stall fed
- ❑ Handeni & Kilosa predominantly extensive
  - ❑ More indigenous breeds
  - ❑ Largely grazing based
- ❑ Mvomero is more transitional
  - ❑ Farmers beginning sedentary agriculture
  - ❑ Beginning to adopt improved breeds
- ❑ Differences could imply different needs & varying preferences for milk marketing arrangements

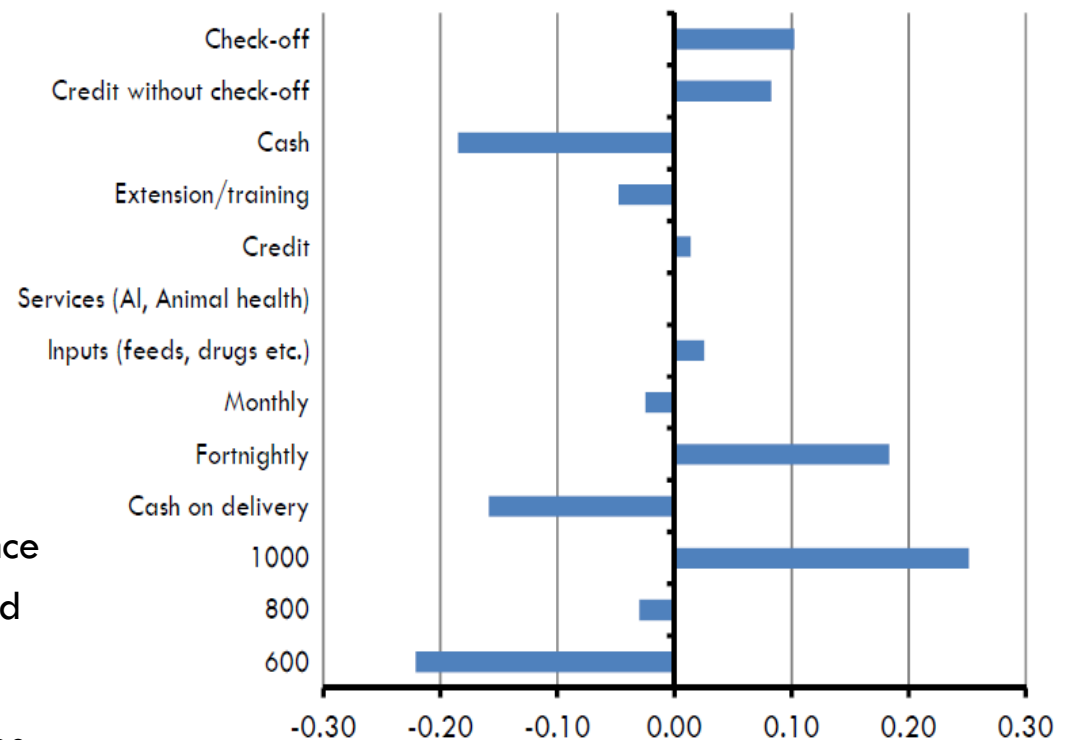




# Results - Descriptive

- ☐ Higher prices contribute to higher preference for options
- ☐ Payment on a fortnight basis also increases preference for options
  - ☐ Cash and monthly payment lowers preference for options
- ☐ As for bundling of inputs/services
  - ☐ Bundled inputs and credit increase preference for options
  - ☐ Bundled extension lowers preference
  - ☐ Preference is indifferent to bundled services
- ☐ Payment for bundled inputs/services
  - ☐ Check-off and credit payment increase preference; check-off has higher scores
  - ☐ Cash payment lowers preference

Figure 1: Estimates from the Most-Least Scores



The Score is calculated as  $M-L/(m \times n)$ ;

Where  $M$  is the number of times respective attribute appeared in hub options chosen as most preferred;  $N$  is the number of times the respective attribute appeared in hub options chosen as least preferred had the respective attribute level;  $m$  is the number of times the level was present in the choice cards for each respondent and;  $n$  is the number of respondents.



# Results – Mixed Logit Analysis

- ☐ Farmers prefer bulk payment for milk but made **fortnightly**
- ☐ Milk marketing bundled with **input provision** attractive
- ☐ Farmers prefer credit or check-off as a mode of payment for bundled inputs/services; **check-off more preferred**
- ☐ Derived standard deviations also reveal significant spread of most coefficients
- ☐ Preference heterogeneity in the population
- ☐ We are therefore exploring latent class modelling that will allow coefficient to vary across groups

Table 2: Simulated ML Estimates from Mixed Logit Model

Variables	Mean		SD	
	Coefficient	SE	Coefficient	SE
Price of milk per litre (Tshs)	0.003***	0.000	0.003***	0.000
Fortnightly <sup>a</sup>	0.531***	0.053	-0.812***	0.060
Monthly <sup>a</sup>	0.051	0.062	1.049***	0.068
Services <sup>b</sup>	-0.142***	0.049	0.064	0.094
Credit <sup>b</sup>	-0.042	0.051	-0.240***	0.086
Extension <sup>b</sup>	-0.178***	0.049	0.075	0.092
Credit without check-off <sup>c</sup>	0.322***	0.044	0.264***	0.076
Check-off <sup>c</sup>	0.403***	0.057	0.984***	0.061
Observations	16,596			
Log likelihood	-5144			

\*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% level, respectively.

<sup>a</sup> Reference frequency of payment for milk is cash.

<sup>b</sup> Reference service is input provision.

<sup>c</sup> Mode of payment for services is cash on purchase.

# Results – Latent Class Model

Groups show differences in preference for mode of payment for milk

Differences also exist in preferences for mode of payment for bundled input/service

Variables	Group 1 (16.1%)		Group 2 (41.6%)		Group 3 (42.3%)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Fortnightly milk payment	0.674***	0.178	0.492***	0.054	0.591***	0.071
Monthly milk payment	-0.534**	0.217	-0.519***	0.097	0.837***	0.079
Services provision	-0.063	0.277	-0.286***	0.072	0.034	0.074
Credit provision	0.416	0.265	-0.295***	0.081	0.002	0.079
Extension/training	-0.179	0.201	-0.407***	0.077	-0.071	0.074
Credit without check-off	0.736***	0.262	-0.199**	0.081	0.881***	0.093
Check-off	0.687***	0.230	-0.407***	0.079	1.289***	0.099
Price	0.010***	0.001	0.002***	0.000	0.001***	0.000
Log likelihood						-5202.1
$\rho^2$ (pseudo R <sup>2</sup> )						0.144
Number of observations						5532

\*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% level, respectively; <sup>a</sup> Reference frequency of payment for milk is cash; <sup>b</sup> Reference service is input provision; <sup>c</sup> Mode of payment for services is cash on purchase.

# Results – Latent Class Model

All groups value fortnight payment but group 3 places more value – **largely intensive systems**

Group 3 value even longer payment period; Groups 1 & 2 prefer cash to monthly payment – **largely extensive**

Group 2 prefer bundling of inputs relative to other services – **Group distributed across project sites**

Groups 1 & 3 prefer credit or check-off payment for bundled inputs; Check-off highly attractive for Group 3 – **largely intensive systems with high input demand**

Table 4: Willingness to pay (WTP) Estimates from Latent Class Model

Attributes levels	Group 1	Group 2	Group 3
Fortnightly milk payment	-64.68***	-321.72***	-509.81***
Monthly milk payment	51.27**	339.40***	-722.00***
Services provision	6.01	187.13***	-29.64
Credit provision	-39.89	193.06***	-2.072
Extension/training	17.18	266.31***	60.95
Credit without check-off	-70.58***	130.48**	-760.74***
Check-off	-65.91***	266.42***	-1112.27***

Table 5: Basic Characterization of Groups

Attributes levels	Group 1	Group 2	Group 3
Annual household expenditure (USD)	1,664	1,460	1,273
Education level of respondents **	4	5	8
Kilosa ***	.35	.29	.11
Lushoto ***	.10	.21	.54
Mvomero***	.35	.24	.13
Handeni	.19	.26	.21

# Conclusions

- ❑ Price remains a top priority in preference for hub options
- ❑ Smallholders prefer bulk payment albeit not too long
- ❑ Smallholders prefer hubs that bundle milk marketing with input provision
- ❑ Significant heterogeneity exist:
  - ❑ Preference for milk payment mode influenced by livestock systems (livelihood options)
  - ❑ Bundling of inputs is popular nearly across all project sites – preferred by many more in extensive systems (with limited access to input retailing systems)
  - ❑ Non cash payment for bundled services in both extensive and intensive systems but check-off more attractive in intensive systems
- ❑ Preference heterogeneity should determine adaptation of dairy hubs in Tanzania

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