

MilkIT Innovation platform impact assessment in India & Tanzania

based on conceptual framework
by Dr. Jo Cadilhon

Research Report Oct 2013 – Mar 2014



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Outline

- MilkIT & project sites
- Research objectives & methodology
- Empirical findings
- Conclusions

MilkIT & project sites

MilkIT project

“Enhancing dairy-based livelihoods in India and Tanzania through feed innovation and value chain development”

Goal

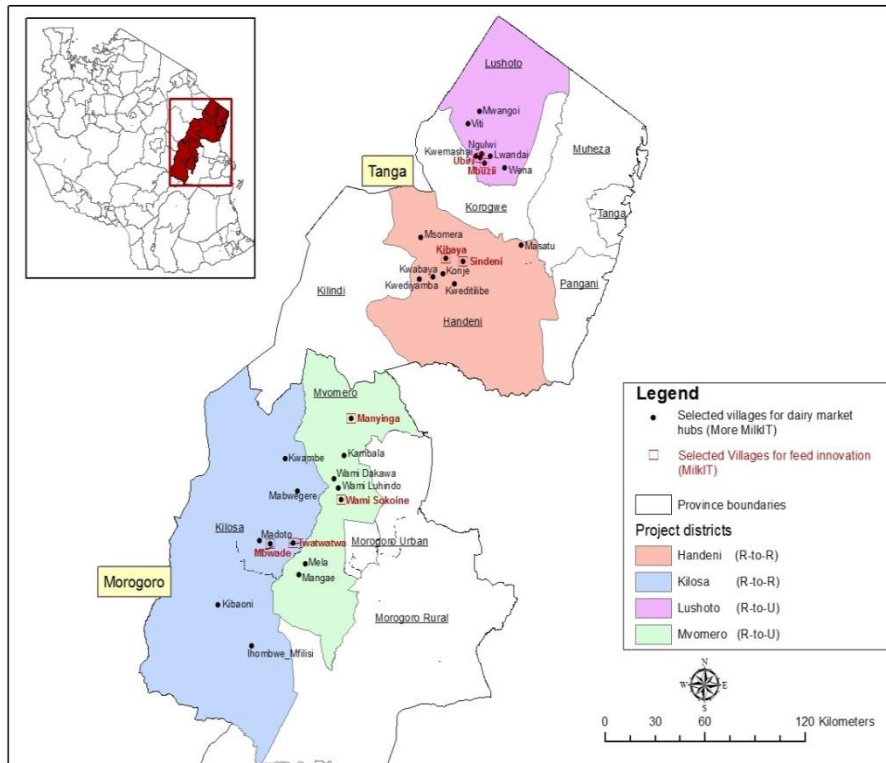
To contribute to improved dairy-livelihoods via intensification of smallholder production focusing on enhancement on feeds and feeding using innovation and value chain approaches.

Objectives:

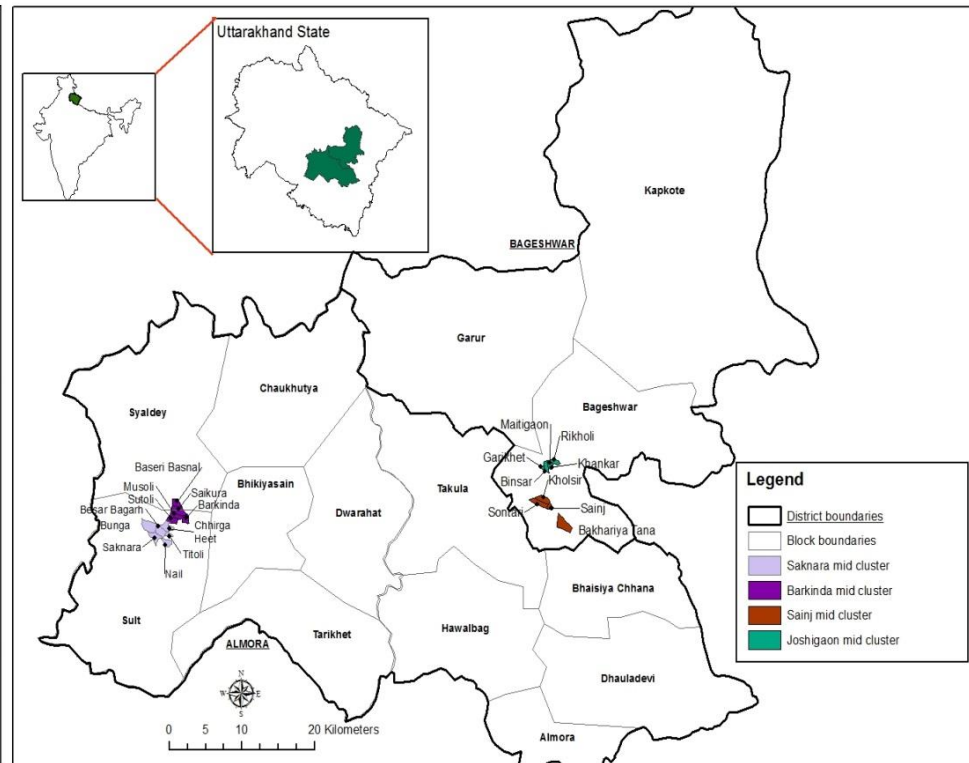
- Institutional Strengthening
- Productivity Enhancement
- Knowledge Sharing

Program sites & platforms

Tanzania



India



India: 4 feed IPs & 2 dairy IPs (research sites: Sainj, Joshigaon, Baseri, Titoli)

Tanzania: 8 feed IPs – mostly farmers (research sites: Mbuzii, Lushoto & Sindeni, Handeni, Tanga)

Production system: India vs Tanzania

Livestock Production System is completely different between India and Tanzania in following aspects:

- Type of dairy animals: mostly local breeds (Buffalo and cattle)
- Number of dairy animals (India: 1.1 | TZ: Lushoto: 1.75 ; Handeni: 12.77)
(Respondents in Handeni, particularly Maasai people, tend to understate their herd size.)
- Feeding system (Stall feeding and grazing)
- Purpose of livestock keeping
- Crop and livestock

Research objectives & methodology

The conceptual framework for innovation platform impact assessment adapted to MilkIT in India & Tanzania

'Structure'

'Conduct'

'Performance'

IP 'Structure'

- Membership composition & diversity
- Decision making process
- Committees
- Source of funding
- Staff availability

Individual 'structure'

- Type of chain stakeholder
- Gender
- Level of education
- Indicator of wealth

External environment

- Legal and regulatory framework
- Cultural norms

'Conduct' of IP members

Information sharing: *what kind of info is shared and whether it is relevant to achieve IP objectives;*

Communication: *means & frequency of communicating & info sharing;*

Coordination;

Joint planning: *farmers and partners are aware of each other's activities and make plans together;*

Trust.

IP Performance indicators

1. *Adoption of new dairy production practices & activities*
2. *Year round availability of feed*
3. *Improved market access (milk)*
4. *Access to livestock inputs & services*
5. *Increased milk production & productivity*
6. *Increased income from milk*
7. *Policy influence (N/A in Tz)*

⇒ **Indicators for Improved livelihood outcomes:** reduced vulnerability via reduced seasonality + more income + improved food security.

Field testing of the conceptual framework

Oct 2013 – Apr 2014

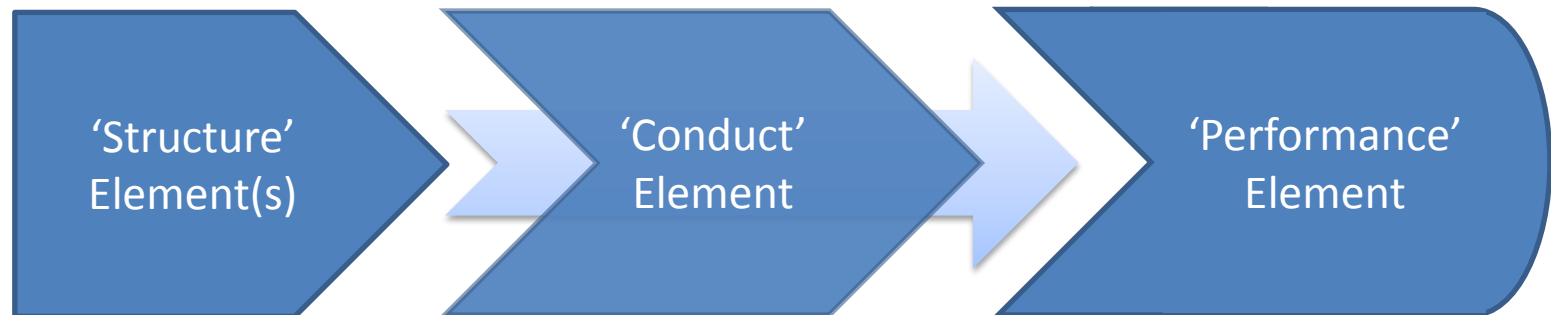
- Select one 'conduct' element & one 'performance' element
- Propose statements describing these two elements based on literature;
- Collect other/better statements from IP stakeholders via focus group discussions;
- Interview with individual IP members & non-members for them to evaluate the statements by five levels of approval (five-rank Likert-scale);
- Use **factor analysis** to reduce statements to 2-3 components.

| 'Conduct' | 'Performance' |
|---------------------------------|---------------------------------------------------------------|
| 'Conduct' of IP members | Platform'performance' |
| <i>Communication (Diep)</i> | <i>Year round availability of feed (Diep)</i> |
| <i>Joint planning (Shanker)</i> | <i>Increased milk production & productivity (Shanker)</i> |

Field testing of the conceptual framework

Oct 2013 – Apr 2014

- Constitute a *baseline situation* of the elements of structure, conduct and performance
- Analyse data collected from the platforms, using **multiple regression** analyses, to test the *simplified conceptual framework* of the selected elements of structure, conduct and performance.



Data & Analysis

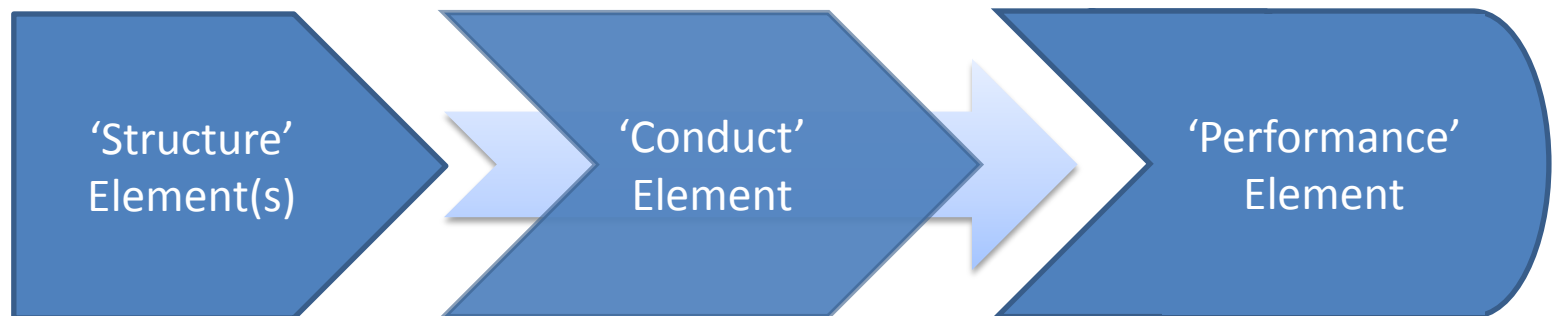
2 months in India & Tanzania for data collection

India: 4 FGDs + **124** interviews + key informant interviews

Tanzania: 2 FGDs + **121** interviews in Sindeni & Mbuzii village + key informant interviews

(50% IP members + 50% non-members; 50% in each district)

- Descriptive Statistics (also usable for project reports)
- Factor analysis on Performance variables (Likert scale) => dependent variables
- Factor analysis on Conduct variables (Likert scale) => independent variables
- Select other Structure & Conduct variables from other (non-Likert) questions => independent variables
- Multiple regression to test the SCP framework



Empirical Findings

MilkIT India

Joint planning Indicators:

Example of independent variables via Factor Analysis

| | | |
|--------------------------------------------------|--------------------|-------------------|
| Cronbach's Alpha | | N of Items |
| .736 | | 6 |
| KMO and Bartlett's Test | | |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .776 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 146.310 |
| | df | 15 |
| | Sig. | .000 |

Eigen values > 1 and Total variations explained by two factors : 60.02%

| | Factor loadings | Communalities |
|--------------------------------------------------------------------------------------------------------------------|------------------------|----------------------|
| • Joint planning of activities with my value chain partners has improved recently | .680 | .566 |
| • My value chain partners and I plan activities together according to our production potential and customer demand | .825 | .696 |
| • I carry out joint planning mostly with the fellow farmers | .698 | .499 |

Two new factors: **Joint planning of activities** (above) & **Application of joint planning**

Regression models testing the SCP framework: Feed management & Milk production

Model 1: Improved management in feeding and dairy production

Model 2: Increased milk production

Model 3: Increased milking days of dairy animals

Regression models testing the SCP framework:

Feed management & Milk production

| Dependent Variable | Explanatory Variable | Beta value | P-value | R ² | VIF | D/W |
|----------------------------------------|------------------------------|------------|---------|----------------|-------|-------|
| Increased Management Practices | Joint Planning of activities | .280 | .001 | .313 | 1.051 | 1.761 |
| | Application of JP | .207 | .010 | | | |
| | Seniority | .181 | .025 | | | |
| | Respondent's education | .290 | .000 | | | |
| Increased Milk Production | Joint Planning of activities | .219 | .015 | .09 | 1.023 | 2.042 |
| | Source of Income | -.176 | .050 | | | |
| Increased Milking days of dairy animal | Joint Planning of activities | .286 | .008 | .441 | 1.144 | 1.951 |
| | Freq. attending IP | .289 | .008 | | | |
| | Respondent's education | -.302 | .011 | | | |
| | Age of respondent | .345 | .003 | | | |

Linearity of variables exists, No heteroskedasticity, No multi-collinearity, No autocorrelation

Some conclusions

- Since project is still in output stage it needs more time to see actual impact of IP in increased milk production
- From regression models:
 - Preliminary result shows positive impact of structure and conduct of IP on increased milk production
 - Seniority in IP has positive impact on improved management practices in feed and dairy.
 - Joint planning has positive impact on increased milk production
 - No significant difference between IP members and non participating members.
 - Milk collection centers and SHG meeting are focal areas to share information and carryout joint planning
- The SCP framework seems effective to evaluate impact of IPs.
- Various other benefits to farmers from the project and IPs.

Empirical Findings

MilkIT Tanzania

Feed Availability Indicators:

Example of dependent variables via Factor Analysis

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|--------------------------------------------------|----------------------------------------------|-------------|
| .694 | .700 | 3 |
| KMO and Bartlett's Test | | |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .664 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 63.094 |
| | df | 3 |
| | Sig. | .000 |

Eigen value > 1 and Total variations explained by all factors : 62.5%

| | Factor loadings | Communalities |
|---------------------------------------------------------------|-----------------|---------------|
| mipro_feed quality improved over the past year | .820 | .630 |
| feedav_variety of feeds used increased in past year | .794 | .573 |
| feedav_easier now to purchase inputs for feed than a year ago | .757 | .672 |

One factor: Access to larger variety and better feeds

Regression models testing the SCP framework:

Feed Availability as performance indicators

| Dependent Variable | Explanatory Variable | Standardised Beta | P-value | Adjusted R ² |
|---------------------------------------------------------|-----------------------------------|-------------------|---------|-------------------------|
| <i>Access to larger variety and better feeds</i> | Sources of info 1 | .242 | .011 | .408 |
| | Quality & Frequency of comm. | .202 | .012 | |
| | Sources of info 3 | .151 | .086 | |
| | Gender (1-female) | .201 | .007 | |
| | Lncattle (log) | -.190 | .049 | |
| | Sharing production info (1-share) | .302 | .003 | |
| | Dairy training (1-attended) | -.370 | .000 | |
| | Feed training (1-attended) | .190 | .035 | |

Multicollinearity test: Mean of VIF values: $1.57 < 3$

No Heteroskedascity; No Autocorrelation (Durbin Watson stat: 2.108)

Regression models testing the SCP framework:

Feed Availability as performance indicators

| Dependent Variable | Explanatory Variable | Standardised Beta | P-value | Adjusted R ² |
|-------------------------------------------|------------------------------|-------------------|---------|-------------------------|
| Feed Availability (Dry season) | Sources of info 1 | .133 | .095 | .334 |
| | Quality & Frequency of comm. | .296 | .000 | |
| | Lncowperacre | -.158 | .011 | |
| | Storing feed (1 – store) | .437 | .016 | |

Multicollinearity test: Mean of VIF values: $1.17 < 3$

Heteroskedascity =>White SEs; No Autocorrelation (Durbin Watson stat: 2.180)

Some conclusions

- From the models:
 - **Conduct => performance:** frequency & quality of communication and increased exposure to different sources of information => feed availability & access to feed inputs.
 - **Structure => performance:** others important factor influencing perception of feed availability: number of cattle vs area of food/feed/grazing land available and feed storing (crop residues): Lncattle (-), Lncowperha (-), Storing (+)
 - **IP members vs non-members:** no statistically difference in **feed availability**.
 - Relative low R-squared probably due to missing variables. Suggestions to better validate the conceptual framework: improve sample size & questionnaires to better capture the S, C, P components via more significant variables.
- From descriptive stat. and qualitative data
 - Though not statistically significantly, more people from member sub-group used to attend dairy training and share production info than from non-member subgroup. Members usually have higher incomes and more cattle than nonmembers.
 - 50% & 29% of 121 respondents use maize and minerals respectively to feed their cows (though different in frequency and purposes)
 - In Lushoto, 41% out of 61 respondents conserve feed, ie. crop residues for dry season.
 - 35% of 121 respondents do not sell milk (the larger part of them are in Lushoto and are non-members)

Thank you very much.

Annex – Tanzania

Communication factors– independent variables via factor analysis

| | | Rotated Component Matrix | | | | Communalities |
|--------------------------------------|---------------------------------------------------------------|--------------------------|-------|-------|-------|---------------|
| | | 1 | 2 | 3 | 4 | |
| Sources of info 1 | Comm_contact input traders for feed info | .771 | .003 | .171 | -.156 | .648 |
| | Comm_get feed info from brochures/posters/etc. | .761 | -.003 | .171 | .101 | .618 |
| | Comm_use landlines to call partners for feed info | .741 | -.120 | -.239 | .469 | .841 |
| | Comm_ask extension/technical officers for feed & feeding info | .666 | .265 | -.226 | .437 | .756 |
| | Comm_use internet to get feed info | .663 | -.176 | -.165 | .473 | .721 |
| Sources of info 2 | Comm_attending periodic dairy meetings | -.219 | .768 | .117 | .081 | .659 |
| | Comm_discuss with relatives | .068 | .726 | .233 | .142 | .607 |
| | Comm_discuss with fellow farmers about feed & feeding | .242 | .715 | .272 | .072 | .649 |
| | Comm_communication frequency | -.224 | .605 | .431 | -.279 | .680 |
| Quality & Frequency of Communication | Comm_satisfied with quality of communication in past 6 months | -.013 | .140 | .841 | .090 | .736 |
| | Communication with other stakeholders improved in past year | .087 | .260 | .753 | .118 | .655 |
| | Comm_frequency of feed discussion | .001 | .332 | .701 | .008 | .601 |
| Sources of info 3 | Comm_listen to radio to get feed info | .087 | -.020 | .257 | .766 | .661 |
| | Comm_attending training activities about feed & feeding | .146 | .215 | .035 | .733 | .607 |

| Reliability Statistics | | |
|------------------------|----------------------------------------------|------------|
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .766 | .769 | 14 |

| KMO and Bartlett's Test | | |
|--------------------------------------------------|--------------------|---------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .772 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 697.568 |
| | df | 91 |
| | Sig. | .000 |

| Rotation Sums of Squared Loadings | | | |
|-----------------------------------|-------|---------------|--------------|
| Factor | Total | % of Variance | Cumulative % |
| 1 | 2.803 | 20.020 | 20.020 |
| 2 | 2.355 | 16.823 | 36.843 |
| 3 | 2.355 | 16.821 | 53.665 |
| 4 | 1.926 | 13.759 | 67.423 |

Rotation Method: Varimax with Kaiser Normalization (eigen values of 4 factors >1)

Annex – Tanzania

Some descriptive statistics

| | | | |
|----------------------------------------|------------------------------|-----|-----|
| Handeni | Non-member | 32 | 26% |
| | Member | 28 | 23% |
| Lushoto | Non-member | 30 | 25% |
| | Member | 31 | 26% |
| Marital Status | Single | 1 | 1% |
| | Married | 102 | 84% |
| | Divorced | 1 | 1% |
| | Widow(er) | 17 | 14% |
| Gender | Female | 41 | 34% |
| | Male | 80 | 66% |
| Highest Education of Respondent | Never attended School | 32 | 26% |
| | Not completed Primary School | 8 | 7% |
| | Completed Primary School | 78 | 64% |
| | Completed high School | 2 | 2% |
| | Certificate/ Diploma | 1 | 1% |

Annex – Tanzania

Some descriptive statistics

| | Handeni | Lushoto |
|--------------------------------------------|-----------|---------|
| Age | 44 | 50 |
| Number of people in household | 10 | 5 |
| Number of economically active members | 7 | 3 |
| Food Crop area (acres) | 10 | 3 |
| Feed Crop area (acres) | 0 | 1 |
| Grazing land area (acres) | 14 | 0 |
| Number of cattle/cough (dairy & non dairy) | 50 | 3 |
| L/day/cow average | na | 2.21 |
| L/day/cow – dry season | 0.62 | na |
| L/day/cow - wet | 2.17 | na |
| Number of poultry | 18 | 9 |
| Number of goats | 53 | 4 |
| Annual Income in Tzs | 2,505,191 | 851,360 |
| Annual Income in USD | 1,575 | 535 |

Annex – Tanzania

Some descriptive statistics

50% of 121 respondents use maize to feed their cows (though different in frequency and purposes)

| Statistically different in the means of | Not use maize | Use maize |
|-------------------------------------------------|---------------|-----------|
| Milk prod. (L/day/cow) (37 obs. in Lushoto) | 1.1 | 2.8 |
| Training on dairy and on feed | 10% | 30% |
| Sharing production info with others (yes or no) | 40% | 80% |
| Total land owned (acres) | 20.5 | 7.0 |

29% of 121 respondents use minerals to feed their cows (though different in frequency and purposes)

| Statistically different in the means of | Not use minerals | Use minerals |
|---------------------------------------------|------------------|--------------|
| Milk prod. (L/day/cow) (37 obs. in Lushoto) | 1.5 | 4.2 |
| Being IP member | 41% | 69% |

Annex – Tanzania

Some descriptive statistics

In Lushoto, 41% out of 61 respondents conserve feed, ie. crop residues for dry season.

| Statistically different in the means of | Not store (N) | Store (S) |
|------------------------------------------------------------------------------------|---------------|-----------|
| Likert: I have enough feed during dry season. | 1.83 | 2.44 |
| Total cattle (dairy and non-dairy) | 2.25 | 3.2 |
| Not stat. sig.: S have slightly higher milk productivity & more training & than N. | | |

35% of 121 respondents do not sell milk (the larger part of them are in Lushoto and are non-members)

| Statistically different in the means of | Not sell milk | Sell milk |
|----------------------------------------------------------------------------------------------------------------|---------------|-----------|
| Total cattle (dairy and non-dairy) | 7 | 35 |
| Milk prod. (L/day/cow) (37 obs. in Lushoto) | 0.7 | 3.9 |
| Use minerals for cattle | 10% | 40% |
| Total land owned (acres) | 7.6 | 17.0 |
| Conduct: comm., info sharing, joint planning, trust Performance: Access to milk & input market, milk income | ☹️ | 😊 |

Annex – India

Dependent factors after factor analysis

| Rotated Component Matrix ^a | | | | |
|------------------------------------------------------------------|-----------|-------|-------|-------|
| | Component | | | Comnl |
| | 1 | 2 | 3 | |
| perf_30_a | .821 | .137 | .085 | .700 |
| perf_30_b | .728 | .230 | .193 | .621 |
| perf_34_a | .152 | .736 | -.006 | .565 |
| perf_mp_1 | .259 | .625 | -.033 | .459 |
| perf_mp_3 | .015 | .720 | .264 | .588 |
| perf_mp_4 | .810 | .142 | .112 | .688 |
| perf_mp_7 | .415 | .446 | -.178 | .402 |
| perf_mp_8 | .719 | .276 | .327 | .699 |
| perf_mp_9 | .307 | -.029 | .537 | .384 |
| perf_mp_10 | .011 | .091 | .868 | .762 |
| perf_mp_11 | .634 | .094 | .002 | .411 |
| Extraction Method: Principal Component Analysis. | | | | |
| Rotation Method: Varimax with Kaiser Normalization. ^a | | | | |
| a. Rotation converged in 6 iterations. | | | | |

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|----------------------------------------------|------------|
| .781 | .803 | 11 |

| KMO and Bartlett's Test | | |
|--------------------------------------------------|--------------------|---------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .826 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 374.523 |
| | df | 55 |
| | Sig. | .000 |

Three factors that explain 57% of variation extracted.

Annex – India

Some descriptive statistics

| Indicator | Type | Mean |
|-----------------------------------------------|-------------------|-----------|
| Number of Family members in the household | IP Member | 6.52 |
| | Non-Participating | 6.32 |
| | Aggregate | 6.42 |
| Available agricultural land (Nali) | IP Member | 13.58 |
| | Non-Participating | 11.76 |
| | Aggregate | 12.67 |
| Number of Dairy Animals | IP Member | 1.11 |
| | Non-Participating | 1.11 |
| | Aggregate | 1.11 |
| Age of the Participant | IP Member | 44.16 |
| | Non-Participating | 48.37 |
| | Aggregate | 46.27 |
| Estimated Annual Income of HH (Indian Rupees) | IP Member | 95000.00 |
| | Non-Participating | 100000.00 |
| | Aggregate | 100000.00 |

Annex – India

Some descriptive statistics

| Variable | | | Percentage | |
|----------------------------------------|------------------------------|-----------|-------------------|-----------|
| | | IP Member | Non-Participating | Aggregate |
| Gender | Male | 35.5 | 25.8 | 30.6 |
| | Female | 64.5 | 74.2 | 69.4 |
| Level of Education | Never attended school | 22.6 | 41.9 | 32.3 |
| | Not completed primary school | 6.5 | 17.7 | 12.1 |
| | Completed Primary school | 40.3 | 25.8 | 33.1 |
| | Completed high school | 11.3 | 11.3 | 11.3 |
| | Certificate/diploma | 16.1 | 3.2 | 9.7 |
| | First degree and above | 3.2 | 0.0 | 1.6 |
| | | | | |
| Primary Activity | Livestock keeping | 8.1 | 1.6 | 4.8 |
| | Crop farming | 11.3 | 16.1 | 13.7 |
| | Mixed crop and livestock | 67.7 | 66.1 | 66.9 |
| | Trading/merchant | 6.5 | 1.6 | 4.0 |
| | Farm labour on other farm | 4.8 | 12.9 | 8.9 |
| | Other | 1.6 | 1.6 | 1.6 |
| Type of concentrate use | Farm-made concentrate | 85.5 | 91.9 | 88.7 |
| | Locally made concentrate | 1.6 | 3.2 | 2.4 |
| | Factory-made concentrate | 12.9 | 4.8 | 8.9 |
| To whom do you usually sell your milk? | Do not sell | 17.7 | 21.0 | 19.4 |
| | Group collection centre | 30.6 | 25.8 | 28.2 |
| | Process before selling | 1.6 | 6.5 | 4.0 |
| | State collection centre | 25.8 | 25.8 | 25.8 |
| | Neighbours | 19.4 | 21.0 | 20.2 |
| | Local Restaurants/Cafe | 4.8 | 0.0 | 2.4 |

Annex – India

Some descriptive statistics on Likert data

| Statements | Type | Response average | Sig. |
|---------------------------------------------------------------------------------------------------|------|------------------|------|
| I usually share knowledge about dairy production with other stakeholders. | IP | 4.774 | .001 |
| | Non | 4.129 | |
| Extension agents usually provide information that is relevant to my needs and production calendar | IP | 4.242 | .006 |
| | Non | 3.672 | |
| I have greater trust in my supplier/customer if they are also part of a group I am part of | IP | 4.082 | .018 |
| | Non | 4.565 | |
| My viewpoints are taken into account by my value chain partners when they plan their activities | IP | 3.767 | .029 |
| | Non | 3.371 | |
| In the past one year, I have adopted new practices in feed production or feed management | IP | 4.355 | .008 |
| | Non | 3.806 | |
| In the past one year, I have applied new techniques into other dairy production activities | IP | 3.839 | .003 |
| | Non | 3.145 | |
| I can get inputs and services at cheaper price than a year ago | IP | 1.306 | .003 |
| | Non | 1.710 | |
| I am replacing local dairy breeds with improved and crossbred animals | IP | 2.258 | .002 |
| | Non | 1.387 | |
| I am well aware about use of mineral nutrients in dairy animals | IP | 3.419 | .000 |
| | Non | 2.210 | |
| Sanitation in animal barns on my farm has been improved compared with last year | IP | 4.726 | .014 |
| | Non | 4.355 | |
| The quality of feed that I am using for my dairy animals has improved over the past year | IP | 4.306 | .003 |
| | Non | 3.710 | |