Centenary Bank

Module 3

Agricultural Credit Risk Management

Wasmus Consulting

Part 1

- Introduction

- Question:
  - What is risk?

What is Risk?

- What is risk?
  - Possibility of loss
  - Possibility that things do not work out as planned
  - Uncertainty

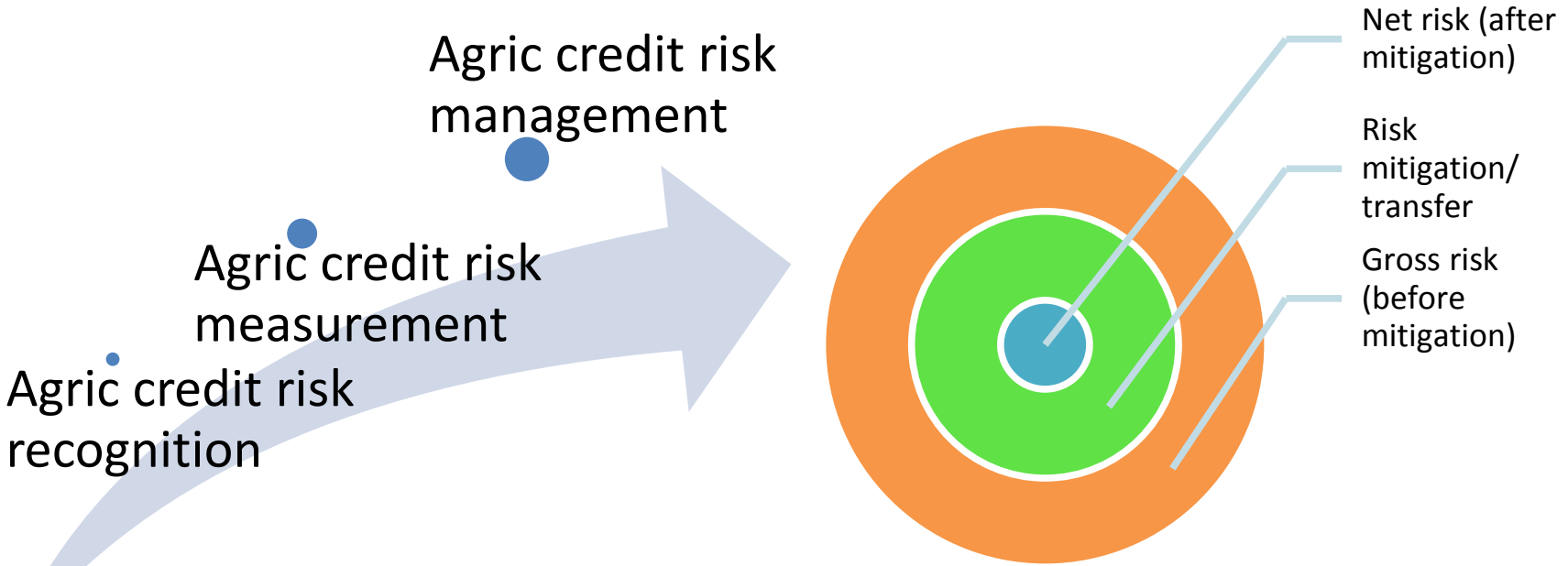
- In (agricultural) lending we:

“trade the present”	(the agricultural loan)
“for the future”	(loan repayments)
“against a cost”	(interest payments)

- The future is uncertain => risk is present in what we do

Risk management framework for agricultural credit

Centenary Bank



Part 2

- Risk recognition

- Individual exercise (5 minutes):
  - List all risks that agricultural lending is subject to.

Risk recognition – types of risks related to agric lending

- Operational risk
- Credit risk
- Intrinsic risk
- Concentration risk
- Agricultural production risk
- Marketing and price risk
- Untimely disbursement risk

Risk recognition

- **Operational risk**: unexpected losses due to:
  - inadequate information systems and controls
  - operational problems
  - breaches in internal controls
  - fraud
  - human error
  - management failure
  - unforeseen catastrophes.

Risk recognition

- **Credit risk**
  - The borrower may not pay as scheduled or may not pay at all => asymmetrical distribution of information.
  - Risk related to the design of credit arrangements: are they adequate or do they cause the borrower to default?

Risk recognition

- **Intrinsic risk**
  - risk associated with the financial situation, skills and experience of an **individual borrower**.
- Does the borrower have the skills and experience to make the project work?

Risk recognition

- **Concentration risk**
  - risk associated with a concentration of borrowers with certain characteristics in a loan portfolio that are subject to similar adverse events.
    - maize farmers may be subject to price risk;
    - coffee farmers may be subject to risk of coffee berry borer.
- The higher the concentration of similar characteristics in a loan portfolio, the higher the concentration risk may be.

Risk recognition

- **Agricultural production risk** can be broken down into:
  - Climatic risk: the occurrence of drought, excessive rainfall, temperatures, hailstorms etc.
  - Risk of pests and diseases;
  - Risk related to farm management (intrinsic risk).
- Such risks are higher for farmers:
  - engaged in monoculture of crops
  - seeking to increase their incomes through higher-risk, higher-return cropping strategies

Risk recognition

- **Marketing risk** relates to the inability to sell on time, in the right quantities and/or at an acceptable quality standard
- **Price risk** is the risk that earnings decline as a result of a change in the level or volatility of commodity prices.
- Price risk for produce traders:
  - Agree on purchase price from farmers without having agreement on selling price (they go 'long')
  - Agree on selling price with buyer without having an agreement on the purchase price with farmers (they go 'short')
- The greater the quantity, the greater the potential loss; the longer the contract, the greater the potential loss.

Risk recognition

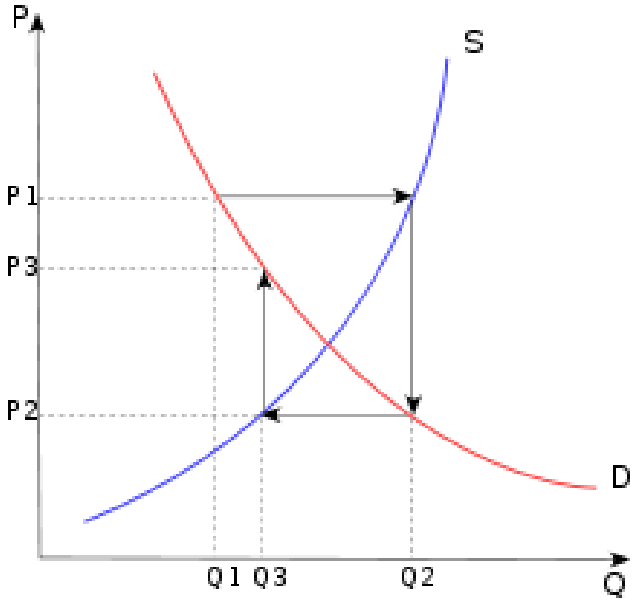
- **Cobweb model – price risk**
- Assume:
  - Small crop (strawberries) due to bad harvest
  - Leftward shift of supply curve results in high prices
  - Farmers raise production in following year
  - Large crop results in low prices
  - Farmers will decrease production resulting in high prices again

Risk recognition

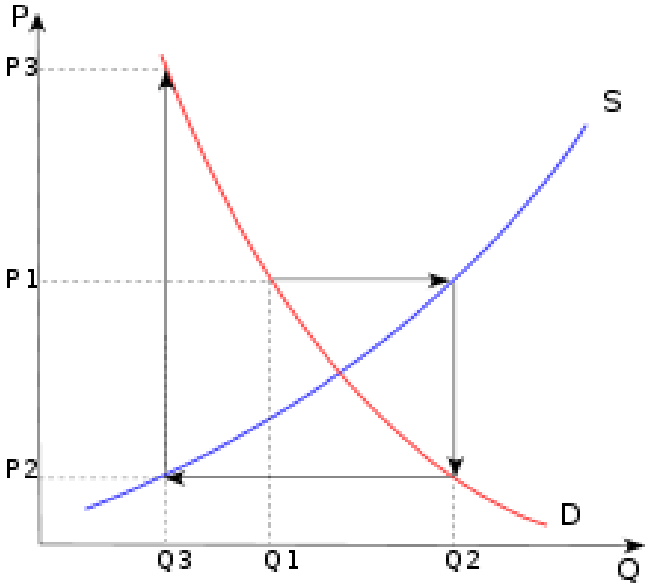
- **Cobweb model – price risk**
  - As process repeats itself, price and quantity trace out a spiral
  - Depending on the level of (in)elasticity of demand for agricultural produce, the spiral may go towards an equilibrium (inward spiral) or towards increasing price fluctuation (outward spiral)
- In agricultural markets, there is inelasticity of demand contributing to price fluctuations

Risk recognition

- **Cobweb model**



Stable case



Unstable case (inelastic demand

Risk recognition

- **Untimely disbursement risk** refers to the risk that the bank is late in disbursing the loan, making the loan unusable for purchasing the necessary inputs, or even worse, leading to a delay in sowing/ planting.

Part 3

- Risk measurement

Risk measurement

	Form of measurement	Source
Operational risk (quarterly)	Staff turnover of agric. LO Fraud damage (in USD) Breaches of procedures	Branch info; HR statistics; Internal audit reports
Credit risk & intrinsic risk **Breakdown by: agricultural credit product and subsector**	Credit scorecards for agric. lending Portfolio quality indicators - Portfolio at Risk (PAR) - Migration analysis - Vintage analysis Growth indicators - Growth per month Percentage of agric. loan portfolio under Danida LG	Core banking system + own calculations
Concentration risk	Agric. portfolio as % of total Detailed breakdown of agricultural portfolio by agricultural sub-sector	Core banking system; own calculations

Risk measurement

	Form of measurement	Source
Agricultural production risk - **Climatic risk** - **Risk of pest and diseases**	Up-to-date weather forecasts	http://www.fews.net/east-africa/uganda
Market and price risk	Development of farm gate and retail prices per week/ month	Infotrade, FEWS, Farmgainafrica.
Untimely disbursement risk	Average processing time since application	

Operational risk measurement

- **Staff turnover**
  - Knowledge and experience leaves the bank
  - Take clients along to competing institution

Agric staff turnover = $\frac{\text{no. of agric. staff that left in Q}}{\text{no. of agric. staff}}$

- **Fraud occurrence and audit findings**
  - Number of fraud incidents linked to agric. credit
  - Number of breaches of procedures linked to agric. credit.

Credit risk measurement

- **Credit scorecards** for agricultural lending (newly developed by Centenary Bank):
  - 1 for loans below 50 million Shs
  - 1 for loans above 50 milllion Shs.
- **<u>Scorecard for loans below 50 million Shs</u>**
  - **Part A:** the same as the credit score card in use in the Bank, slightly modified for a maximum score of 85 points.
  - **Part B:** evaluation of risks related to crop production (15 p.)
  - **Part C:** evaluation of risks related to for livestock (15 p.) production, processing or marketing

Credit risk measurement

- Scorecard part B

Sl No	ITEM	RANGE	SCORE	INPUT
1	**EXTENT OF FARM CULTIVATED**	MORE THAN 20 ACRES	5	
		>10 ACRES BUT <20 ACRES	4	
		>5 ACRES BUT <10ACRES	3	
		MORE THAN 2 ACRES	2	
		2 ACRES AND LESS	1	
		Input Score Given		
2	**AGRI-PRODUCTION RISK**			
	YIELD as percentage of previous year's yield	as per or beyond estimate/ 100%	4	
	(If yield is fluctuating, immediate three crop seasons' average yield can be reckoned)	likely to be 85% or above	3	
		likely to be between 70%-85%	2	
		likely to be between 70%-60%	1	
		likely to be less than 60%	0	
		Input Score Given		
3	**PRICE RISK**			
	Price Volatility observed last season	Stable or Low volatility up to 10%	6	
	Price Volatility=	Volatility >10% but <20%	4	
	(Max Price-Min Price)/Average Price	Volatility >20% but <30%	3	
	Average Price=(Max +Min)/2	Volatility >30% but <40%	2	
	(If immediate preceding season's price is not reflective of normal trend, immediate three crop seasons' average price can be reckoned)	Volatility >40% and <50%	1	
		Very High volatility 50% or more	0	
		Input Score Given		
	SUB TOTAL FOR AGRI PRODUCTION RISK	**PART B**	**15**	**0**

- Key parameters
  - No. of acres under cultivation
  - Production risk (Yield fluctuation)
  - Price risk (Price fluctuation)

Credit risk measurement

- Scorecard part C

	PART C - AGRI PROCESSING, AGRI MARKETING & LIVE STOCK ACTIVITIES (Non-farm activity)			
`1	**REGULARITY OF INCOME FROM ACTIVITY**			
		Stable year round income	5	
		Seasonal income	3	
		Sporadic	1	
		Input Score Given		
2	**DEMAND SUPPLY GAP & Competition**	Good demand and low competition	5	
		Adequate demand with fair competition	3	
		Declining demand & highly competitive	1	
		Input Score Given		
3	**TREND IN NET INCOME**			
		Increasing	5	
		Steady	3	
		Declining	1	
		Input Score Given		
	SUBTIOTAL FOR NON-FARM ACTIVITY	**Part C**	**15**	0

- Key parameters
  - Regularity of income;
  - Competition;
  - Trend in net income.

Credit risk measurement

- **Scorecard for loans above 50m Shs.**
  - Consists of 7 detailed sub-scorecards with 11-13 separate items to score.
  - Scoring:
    - General: 55 points
    - Agric. sub-scorecards: 30 points
    - Factors influencing the interest rate: 15 points

Credit risk measurement

- **Portfolio at Risk** (PAR):
  - o/s principal in arrears

    o/s principal
- PAR broken down by aging group
- Disadvantages of PAR
  - In case of portfolio growth: underrepresentation
  - In case of portfolio shrinkage: overrepresentation
  - Write offs disappear from PAR

Credit risk measurement

- Migration analysis
  - Tool that analyses what volume or percentage of overdue loans migrate from one aging category to another.
  - For instance, what percentage of loans overdue from 1-30 days migrates to the critical category of 31-60 days overdue in 1 month time?
  - Helps us to interpret the effectiveness of loan collection and spot adverse patterns in collection early on.
  - Ideally migration analysis is measured against pre-set limits.

Credit risk measurement

- **Migration analysis**

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11
1 to 30	1,935131	2,320,994	2,592,538	2,663,674	2,797,524	2,500,743	2,707,490	2,590,905	2,194,010	2,177,431	2,298,966	2,428,209
31 to 60	434,935	476,587	531,631	374,014	465,420	487,198	457,444	376,317	334,969	378,196	472,781	478,119
61 to 90	226,621	255,278	283,031	244,271	215,527	327,555	270,308	298,817	262,952	253,661	175,615	253,791

1-30 to 31-60		**25%**	**23%**	**14%**	**17%**	**17%**	**18%**	**14%**	**13%**	**17%**	**22%**	**21%**
31-60 to 61-90		**59%**	**59%**	**46%**	**58%**	**70%**	**55%**	**65%**	**70%**	**76%**	**46%**	**54%**

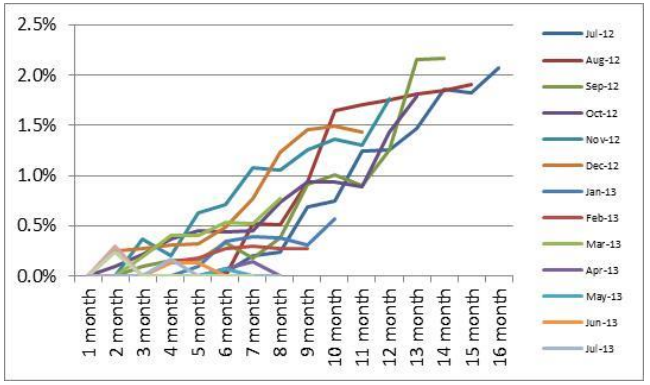
Credit risk measurement

- **Vintage analysis**
- A tool that allows for performance comparisons of portfolio quality between portfolio segments, usually months of disbursement (origination).
- Each cell in a vintage table shows a delinquency percentage, similar to the PAR rate
  - rate is calculated as a percentage of amount disbursed in a certain month, and not as a percentage of the outstanding portfolio.
  - written off loans or rescheduled loans are not excluded from the delinquent loans.

Credit risk measurement

- **Vintage analysis table & graph**

	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13
Months on book																
0																
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%	
3	0.0%	0.0%	0.1%	0.2%	0.4%	0.3%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%		
4	0.0%	0.0%	0.2%	0.4%	0.2%	0.3%	0.0%	0.1%	0.4%	0.0%	0.0%	0.1%	0.2%			
5	0.0%	0.0%	0.2%	0.5%	0.6%	0.3%	0.1%	0.2%	0.4%	0.0%	0.0%	0.1%				
6	0.0%	0.0%	0.3%	0.4%	0.7%	0.5%	0.3%	0.3%	0.5%	0.1%	0.1%					
7	0.2%	0.5%	0.2%	0.5%	1.1%	0.8%	0.4%	0.3%	0.5%	0.1%						
8	0.2%	0.5%	0.4%	0.7%	1.1%	1.2%	0.4%	0.3%	0.8%							
9	0.7%	0.9%	0.9%	0.9%	1.3%	1.5%	0.3%	0.3%								
10	0.7%	1.6%	1.0%	0.9%	1.4%	1.5%	0.6%									
11	1.2%	1.7%	0.9%	0.9%	1.3%	1.4%										
12	1.3%	1.7%	1.3%	1.4%	1.8%											
13	1.5%	1.8%	2.2%	1.8%												
14	1.9%	1.9%	2.2%													
15	1.8%	1.9%														
16	2.1%															



Credit risk management

- Reading a vintage table:
  - Outer diagonal shows most recent ‘PAR’ of separate vintages by month of disbursement
  - Comparing 2 diagonals:
    - impact of macro events
  - From left to right:
    - consistency of loan portfolio
  - Top to bottom:
    - behavior of a certain vintage.

Case study I

- Complete the case study in groups of 3 to 5.

Concentration risk measurement

- Breakdown of loan portfolio by agricultural sub-sector

`	% of portfolio	Limit
Agricultural production		
Agricultural Marketing		
Agricultural Processing		
Total Agriculture		

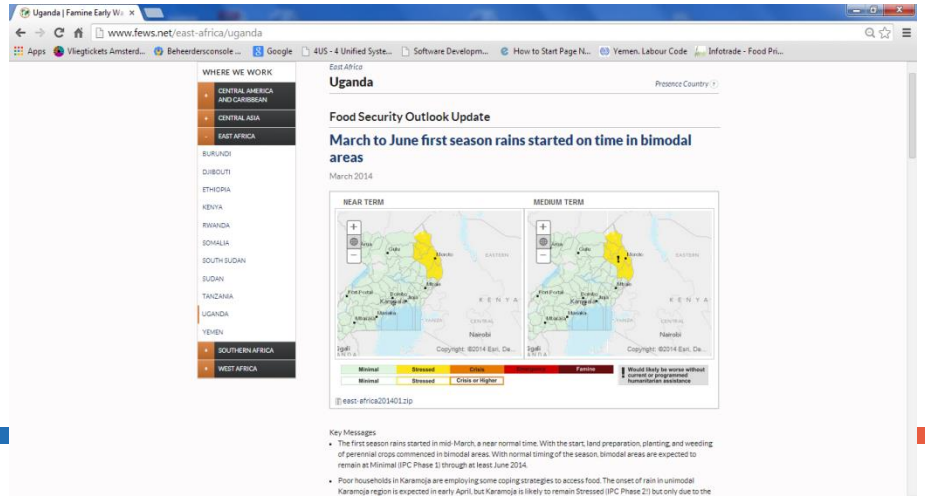
Concentration risk measurement

- **Breakdown of agricultural production**

	% of portfolio	Limit
Dairy		
Poultry		
Cattle breeding		
Pig rearing		
Subtotal livestock		
Matooke		
Maize		
Coffee		
Beans		
…..		
Subtotal crop production		
Total agricultural production		

Agric. production risk measurement

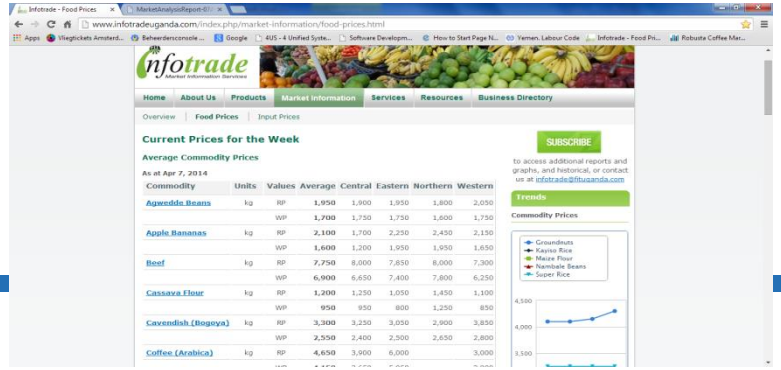
- Difficult to quantify
- Classify loans internally and/ or
- TV, radio, local press
- Rely on external information: http://www.fews.net/east-africa/uganda



Market and price risk measurement

- Look at price developments of main crops!
- Infotrade issues weekly commodity prices on their website by 34 different markets throughout Uganda, and also consolidated prices per region.

- http://www.infotradeuganda.com/index.php/market-information/food-prices.html



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Untimely disbursement risk measurement

- Average processing time per agricultural loan: time between application and disbursement for all loans, expressed in number of days.

$$= \frac{\text{Processing time of all agric. loans disbursed in month}}{\text{Number of agric. loans disbursed in month}}$$

Part 4

- Risk management

Risk management strategies and tools

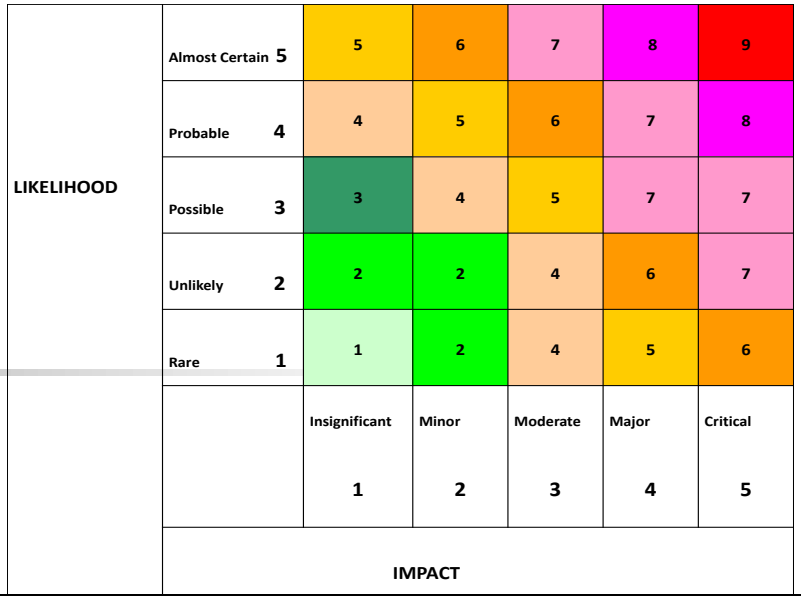
- Risk management: the process of understanding and proactively managing risk before the event responsible for the risk occurs.
- 2 dimensions of risk – see **Risk Matrix**
  - Likelihood
  - Impact
- Risk management needs to lower the likelihood and/ or impact when event occurs

Risk management

- Risk matrix

LIKELIHOOD						
	Almost Certain 5	5	6	7	8	9
	Probable 4	4	5	6	7	8
	Possible 3	3	4	5	7	7
	Unlikely 2	2	2	4	6	7
	Rare 1	1	2	4	5	6
		Insignificant 1	Minor 2	Moderate 3	Major 4	Critical 5
	IMPACT					

Exercise 2



Exercise 2 (in groups of 3-5):

Consider the following risks:

A. Risk of inability to attract and retain good agricultural loan officers
B. Risk of access to the Bank IT server room
C. Risk of giving out ghost loans

Follow steps 1 to 3 for each of the above risk

1. Score the risk before any mitigants are in place, i.e. gross risk (first score likelihood, then impact and note the score).
2. List the mitigants that would reduce the risk
3. Score the risk again after the mitigants are in place, i.e. the net risk

Risk management

- Strategies to manage risk:
  - Risk transfer
  - Risk mitigation
  - Risk coping
- A comprehensive risk management strategy involves a combination of all three.
- Risk management is done at different levels:
  - At client (farm, trader, processor) level
  - At individual loan level
  - At branch or loan officer level
  - At institutional level

Risk transfer

- Risk transfer is the transfer of risk impact to a willing party, for a fee or premium:
  - Commercial insurance (CB: weather insurance)
  - Guarantee schemes (CB: Danida)
  - Hedging (f.i. trader fixes price)
- Risk transfer is usually done within an institutional framework (i.e. at high level)

Risk mitigation through internal processes and controls

- **Risk mitigation** includes activities designed to reduce likelihood and/ or impact.
- Many risk mitigating measures are embedded in processes and procedures => difficult to measure.

1. Risk mitigation at client (farmer) level

- Diversification of income (multiple income sources)
- Irrigation to be less rainfall dependent;
- Use of drought/ pest resistant seeds or planting material;
- Adoption of improved agronomic practices;
- Contract farming to limit price risk.

Conclusion: 1st level of risk mitigation: at farm level

Risk mitigation

2. **Risk mitigation through loan appraisal/ client selection**

- Loan officer should know:
  - To which risks the farmer is exposed
  - How the client mitigates key risks (f.i. multiple Income sources, taken into account in analysis)
- Consider risk associated with 2 drivers of agric. income
  - Price (use low price in analysis)
  - Production (use last season's yield)

  => Avoid overestimating client's repayment capacity
- Make use of agricultural credit scorecards!

Conclusion: 2nd level of risk mitigation: loan appraisal through adequate agric. lending methodology

Risk mitigation

3. Risk mitigation through Branch credit committee

- CC = most important institution within the bank
- Separates loan appraisal from loan approval (dual control)
- Ensures good decisions are made

Conclusion: 3rd level of risk mitigation: loan appraisal through properly functioning credit committee

Risk mitigation

- Post-disbursement risk mitigation through adequate monitoring, collection and recovery
  - Detect potential problems early on
  - Consistent follow up in case of arrears
- Risk mitigation through general system of internal controls
  - For instance I.D. checks at account opening which limit ghost lending

Risk mitigation – risk dashboard

- Risk dashboard
  - Set meaningful limits
  - Actions
    - Corrective action, f.i.:
      - Slow down lending
      - Tighten standards
      - Increase collections
    - Escalation
      - To superior
      - Authority to advise on remedial strategy

Agricultural Credit Risk Dashboard - Maize Valley Branch — Jun-14

Agricultural loans	Actual results	Limit	Deviation%	Risk trend
I. Operational Risk (quarter ending June)				
Staff Turnover (annualized)	12%	10%	20%	↑
Fraud damage in USD	50,000	0	50,000	↑
Breach of procedures	15	25	-40%	↓
Number of exceptions approved by HQ	34	25	36%	↓
II. Credit & Intrinsic Risk				↓
PAR 1-30 days	2.5%	2.5%	0%	→
PAR> 30 days	3.1%	3.0%	3%	↑
PAR> 90 days	1.9%	2.0%	-5%	↓
Migration performing to 1-30d	1.1%	1.0%	10%	↑
Migration 1-30d to 31-60d	13.1%	12.4%	6%	↑
Migration 31-60d to 61-90d	35.0%	44.0%	-20%	↓
PAR30 - 3 months on book	0.0%	0.5%	-100%	↓
PAR30 - 6 months on book	0.5%	0.70%	-29%	↓
PAR30 - 9 months on book	1.2%	1.20%	0%	→
PAR30 - 12 months on book	1.9%	2.50%	-24%	↓
Portfolio growth	1.7%	2%	-15%	↓
Collateral coverage	83%	>90%	-8%	↑
% of agric. loans under Danida LG	55%	>50%	-45%	↑
III. Concentration risk				↓
Agriculture as % of branch loan portfolio	45%	50%	-10%	↓
Agric. production as % of agric pf.	56%	60%	-7%	↓
Agric. Marketing as % of agric. pf.	35%	31%	13%	↑
Agric. Processing as % of agric. pf.	8%	9%	-11%	↓
IV. Agricultural production risk				→
Climatic Risk Outlook	LOW	LOW		→
Maize price (kg)	850			
Matoke price (bunch)	21050			
Coffee Robusta price (kg)	2200			
V. Untimely disbursement risk				↓
Average processing time (days)	4	5	-20%	↓

Exercise 3 – Risk Dashboard

- Complete risk dashboard for a branch of your choice
  - Use real data where possible and where not, use best estimates.

Risk coping/ risk acceptance

- Risks can be accepted if the cost of mitigation outweighs the benefit.
- No action is taken to mitigate risk exposure
- Such a decision needs to be well documented.