Experiences: Irrigated Forages in Ethiopia

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OBJECTIVE

Exploring irrigated forage cultivation to:

- Explore irrigated fodder/forage cultivation as entry point to diversification, intensification and sustainability
- Improve on farm meat and milk production for improved household nutrition and income through filling feed quality gaps in dry season
- Evaluate forage production as cash crop, livelihood and employment strategy

APPROACHES

- Assessment of feed resources, importance and demand for planted forage, and forage preference (demand vs supply driven)
- Testing of annual and perennial grasses and legumes for biomass production, feed-back loops, modification in following cropping seasons
- Mix on actual livestock productivity trials and modeling of animal performance (forage yield >forage quality> estimation of meat and milk production)
- Fodder market studies for demand, price – quality relationships and value chain characteristics to assess forage-as-cash crop fro micro and small enterprise

KEY FINDINGS AND CONSIDERATIONS

- Performance of annual (oats, vetch) and perennial (Napier, Desho) forage

- Additional forage management options supporting increased productivity and sustainability (food-feed-fodder, soil, water)

- Feeding of planted forages to own livestock vs forage market participation

Cont.

- Each farmer allocated 100m^2 plot of land, planted oats, vetch and oat-vetch mixture
- Irrigated the plots once weekly, weeded twice in the growth cycle
- The plots subjected to different harvesting treatments
  - One times cutting after 85 days
  - Two times cutting after 40 and 85 days
  - Three times cutting after 40, 85 and 120 days
- Biomass quantity and quality measured

Cont.

Generally: two cut oats, vetch management preferred farmer option

Treatment	Yield (t DM/ha)	CP (%)	ME (MJ/kg)
Oats Single Harvest	7.60	5.56	7.67
Oats Double Harvest	8.61	11.43	8.25
Oats-Vetch Single Harvest	9.35	5.13	7.51
Oats-Vetch Double Harvest	12.18	9.9	8.14

- Double Harvest superior to Single Harvest
- Oats - Vetch Mix superior to Oats

Cont.

- Each farmer allocated 100 m^2 plot of land initially , for Napier grass establishment
- Shallow wells and pulley system to lift water and irrigate the plots
- Irrigation - once to twice weekly depending on soil moisture
- Fodder quantity and quality measured

Perennial Forages – Multiple harvests

- Napier could be harvested during the course of a year between 6 and 9 times
- Relative to a 12 month growing period a minimum of 17.9 t/ha and a maximum of 23 tons dry matter per ha were observed
- Desho grass yields about 28 t DM /ha annually. Farmer perception of higher water use efficiency of Desho compared to Napier.

Irrigated Forage Use on Farm Versus Forage as Cash Crop

Example Oats-Vetch Mix

- Assuming all oat-vetch is used for milk production (not for maintenance), a 100m^2 oat-vetch mix can give 280kg milk

- But the efficiency depends on the productivity of animals

- But do fodder market exists?

Cont.

- Forages as cash crop options:
  - Fresh grass (Desho) prices for supplier: 1.5 – 2.0 birr/kg
  - Fresh forage market relatively young compared to dry feed (hay, straw) but emerging

Open fodder markets

Cont.

Days required in dependence of cow productivity

	Productivity of cows (kg milk per day)			
	3	6	9	12
Days required to produce 280 kg milk	93	47	31	23

Irrigated Forage Use on Farm Versus Forage as Cash Crop

	Total milk produced if cows give			
	3 kg	6 kg	9 kg	12 kg
Milk yield from use of single cut oats-vetch produced from 100 m^2	75	118 kg	146 kg	166 kg

Cont.

On-farm trial: Effect of supplementing 2.0 kg oat-vetch hay daily on milk yield of lactating cows

Breed type	Milk yield (Lt/day/cow)	
	Before supplementation	After supplementation
Cross-bred	3.0±1.0	5.33±1.04
Local cow	1.75±0.5	2.75±0.65

Findings

Assume:

Napier could be harvested 6 to 9 times in 12 months

Relative to a 12 month growing period, a minimum yield of 17.9 t/ha and a maximum of 23 t/ha dry matter were recorded

Gross value at approximately 150 000 to 200 000 Birr per hectare at fodder markets

Note: up-rooting of Chad and replacement by irrigated fodder observed

Multi-use/multi-objective of irrigated forages: rational

- Extreme scarcity of bio-physical and socio-economic resources
- Risk avoidance and mitigation
- Paradigm of increasing overall productivity in mixed systems

Napier intercropped with Desmodium: fodder quality (protein from Desmodium) plus soil improvement (N-fixation)

Napier intercropped with Pigeonpea: food (grain) plus fodder quality (protein) plus soil improvement (N-fixation)

Hard pan break up – intercropping of pigeon pea with maize increased total productivity

	Yield (t/ha/1st cut)	Crude protein (%)	IVOMD (%)
Sole Napier	3.27	8.3	49.1
Napier + PP1	4.88	12.5	51.2
Napier + PP2	4.34	11.5	52.3

Approach

- Awareness creation through meetings and group discussions
- Selection and training of farmers who showed interest
- Initially 17 farmers were involved, which grew to 300 in the subsequent seasons

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OVERALL CONCLUSION

Allocating land and water exclusively for forage production in small holdings a new departure in Ethiopia but:

Land allocation (doubled on average)

Farm manure application

Seed demand

Numbers of farmers

clearly suggest: <u>irrigated fodder is a realistic and attractive option in Ethiopia for small holdings</u>

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WHERE TO GO FROM HERE

- From experimental/anecdotal to structured impact assessment
- Scaling needs to be planned, central and regional policy support, private sector inclusion (for example seed sector)
- TAMU modeling key for defining demand and opportunity domains (integrated into Ethiopia Feed Supply Demand tool?)
- More structured value chain approach required (*feed/fodder value chain*) with attention given to off-farm actors, activities and transactions

Feedbase_Main

Data Management Data Entry Analysis Help

Feed | Animal | Balance

- Feed
  - Crop residues
    - Fine straw
    - Coarse straw
    - Leguminous straw
  - Concentrates
    - Grains
    - Cakes
    - Bran
    - Chunni
  - Greens
    - Greens

- Regions/Zones/Woredas

Years (Ex. 1986-1990, 1995) : 2016

Data View and Analysis

Table form | Graph | GIS Map

FEEDBASE - Ethiopia

Database and an analysis tool for assessing supply and demand of animal feeds reousres in Ethiopia is a viable decision support system for planning and decision-making in livestock production and dairying. The concept of developing Feed Supply-Demand scenarios from available data was met with considerable interest by the Ethiopian Agricultural Transformation Agency (ATA) and a collaboration was initiated between Indian Council of Agricultural Research(ICAR) and the International Livestock Research Institute (ILRI) to adopt, and develop, the concept for an Ethiopian Feed Supply-Demand Tool (FEEDBASE-Ethiopia). The concept of development of database and tool based on feed supply is estimated from cropping and land use pattern and feed demand from livestock census and nutrient requirement for various categories of livestock based on their body maintenance, production and reproduction potentials.

The Feedbase-Ethiopia module has been developed using user friendly graphical user interface system for accessing the information by user defined query. Thematic maps module has been developed using open source GIS software for digitization, store and generate spatial data. Which is provides geo-information on the quantitative and qualitative availability of different feed resources for individual districts based on crop and land use patters statistics and the requirement in terms of dry matter for standard ruminant livestock unit based on livestock census data. Besides adopting the tool to Ethiopian conditions, a conceptionaldevelopment was decided to customize the tool with interactive features to enable the user to compare and prioritize feed and animal interventions for effect and impact. The feed database and tool in animal and feed resources of Ethiopia would be an important tool and aid for short term and long term planning by policy makers, researchers etc. in improving the livestock productivity in the state. 2-10-8, 2-3-10, 6-19-10,6-6-6, 8-12-3, 8-4-2, 9-1-4, 9-2-6

ATA Agricultural Transformation Agency (ATA), Addis Ababa, Ethiopia

ILRI International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia

Indian Coucilof Agricultural Research, New Delhi, India

Thank you for your attention!

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