PART III

INTEGRATED DEVELOPMENT APPROACH TO AGRO-PASTORAL PRODUCTION SYSTEMS

5. Integrated Development Strategies in Greater Kibwezi Division With Special Emphasis on Agriculture and Related Issues

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Introduction

This paper is an attempt to underscore the importance of the principle of integrated or holistic approach to development for sustainability. To this end the paper gives a broad concept of integration in development before focusing on integrated development in Kibwezi with special emphasis on agriculture. An attempt has been made to define development to provide prologue for informed discussion. The challenges facing development actors have been highlighted before suggesting a way forward.

What is Development?

Development can be defined as a process by which members of a society can increase their personal and institutional capacities to

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mobilize and manage resources in order to produce sustainable and justly distributed improvement in their quality of life consistent with their own aspirations (Synthesis of a number of definitions from IIRR).

Development therefore differs from modernization and growth as they are commonly defined. It cannot be seen as industrialization or an increase in economic output. The definition emphasizes on the process of development and the essential focus on personal and institutional capacity.

The rural poor communities in the Third World are confronted by four basic interlocking problems namely: poverty, ignorance, disease and civic inertia. To address these problems, there is a need for an integrated approach rather than a piecemeal approach.

**The Principle of Integration**

Integration is the process of designing and implementing in a well-coordinated systematic fashion, the various components/activities of a particular project or programme or across several projects/programmes which are themselves inter-related and can be mutually reinforcing to achieve their desired goals and objectives (Conrado S. Navarro - IIRR).

Integration adopts a "system approach" to development where each project/programme or activity is viewed as an integral part of the whole unified process.
An integrated fourfold programme with inter-related projects and activities in the field of education, livelihood, health and self-government is essential. Education is to combat illiteracy; livelihood to fight poverty; health to prevent diseases, and self-government to overcome civic inertia.

Each one by itself can tackle only part of the complex problems of the rural poor. Together, they can tackle the problem at its interwoven roots.

Education and self-government provide the foundation for informed and active peoples participation in the management (i.e. selection, planning, implementation, monitoring and evaluation) of livelihood (agriculture and credit) and health projects, hence ensuring the relevance and sustainability of the projects. (Espoused in the Credo of Rural Reconstruction by James Yen)

Integrated Agricultural Programme - Key to Improved Livelihood in Kibwezi

Situation Analysis

The greater Kibwezi Division viz., Makindu, Kibwezi and Mtito-Andei fall under Arid and Semi-arid Lands of Makueni District. As such, the Division is characterised by problems of unreliable and unevenly distributed rainfall, degradation of unprotected land and factors like limited opportunities for off-farm income-generating activities and credit facilities. Marketing of the farm produce (crop and livestock) has been "hijacked" by middle men who obviously
exploit the poor farmer by capitalising on farmers lack of information and ability to organize themselves into functional marketing institutions. Farm production is constrained by three main factors:

i) Inadequate agronomic skills and practices, resulting from limited access to extension services and research findings.

ii) Limited labour supply at critical peak periods of planting and weeding due to high cost of hiring of tractors and limited animal draft power (particularly for the bottom 30-40% households as indicated by PRA techniques)

iii) Unavailability/inaccessibility of farm inputs, especially seed and farm inputs.

Socio-cultural factors do have their share in making the problem more complex. The predominantly Kamba population has a culture of subsistence farming with very little respect for commercial farming components. The rapid unchecked population growth has given rise to many mouths to feed which has not been matched by increased household production resulting in cyclic food deficit. Recent land demarcation has greatly influenced the livestock keeping pattern in the area.

**Challenges**

Many development actors (NGOs, GOK etc.) have their diverse experiences in the area of promoting agricultural production in ASAL's. For most of them the emphasis has been on increased
agricultural production through use of appropriate technology, use of improved seed and livestock breeds and accessing inputs in some cases.

The above efforts in many cases have smothered the mass crop livestock loss following rainfall failure - a factor in principle beyond the farmers control. If by chance nature happens to favour the farmer with a successful rainfall, the same farmers end up falling prey to the hands of middlemen who seem to know better where and how to market the farmer's produce.

The net effect is that increased production does not guarantee food security nor leads to improved household incomes. The poor farmers find themselves in the vicious cycle of poverty with no money to invest in improving their farming activity and consequent improvement in productivity.

Every successful harvest seems to coincide with a malarial outbreak which ends up forcing farmers to sell the same produce to buy drugs to save the dear life. Other reasons that will force the farmers to sell farm produce include school fee demands and various domestic needs. The irony of the above scenario is that the selling of produce (a bigger percentage) is at a time when the prices are very low.

Rapid depletion of household stocks without replenishment whenever the subsequent rain season fails results in high prices in grains. Farmers are forced to buy food at high prices. Limited off-farm opportunities cause many households to turn to selling their livestock at such times. This coping mechanism happens to be
common amongst ordinary farmers and therefore livestock prices decline often accelerated by pressure to de-stock due to pasture shortage.

**Suggested Way Forward**

- Education programmes and community organization.
- Health programmes.
- Agricultural farming should rest on the two pedals of production and marketing of both livestock and crops.

**Education and Self-governance**

- This forms the foundation of development. This goes beyond the area of literacy and numeracy skills to address awareness of alternatives in life. Community organization should be addressed as good understanding in management of community projects is vital for sustainability.

**Health Programmes**

- This should look at education on skills that prevent health problems and promote good health practices. Provision of safe drinking water should go alongside.
Agriculture

- Accessing extension services through community own resource persons to reinforce the already constrained GOK extension services (e.g. paravets, soil and water conservation volunteers, etc.).

- Diversification of production to encompass cash crops, drought resistant varieties, poultry, small ruminants, environmental protection, agroforestry, etc.

Marketing

- Organizing farmers in small co-operatives through which they can market their produce while at the same time accessing critical farm inputs.

- Accessing credit to strengthen this mechanism of buying and selling later at a time when prices are high.

- Irrigated agriculture.

- Exploitation of the full potential for irrigated agriculture along permanent rivers-the Athi, Yuu, Kiboko, Thange and Mtito which are presently underutilized.

- Co-ordinate the marketing of horticultural produce for increased returns
The task ahead seems obviously a big one. None of us has the capacity to individually accomplish it. However, each one of us has a role to play. It therefore calls for collaboration where the effects of the whole is greater than the sum of parts.

This will call for a multi-disciplinary team. The MALDM has realized the need for this and has integrated its staff. The newly introduced Social Dimension Development Committee (SDDC) by the GOK is yet another great leap in the area of self-governance which recognizes the role of the different local institutions in the process of development.
6. Non-Conventional Feed Resources for Agropastoral Production Systems

Moses M. Nyangito*

Abstract

The agropastoral and pastoral production systems are predominantly confined to ASAL zones, the main emphasis being livestock production based on natural forage. Due to population pressure, these systems have been marginalised to very arid areas where forage production is limited by shortage of rains. The non-conventional feeds should supply nitrogen, energy and some minerals deficient in natural forage. Animal wastes, crop residues, ley grasses and browse are the best alternatives in meeting the feed supply requirements.

Animal wastes include poultry waste, cow dung and pig excret. Poultry waste, unlike other animal wastes, is rich in nitrogen and minerals; hence, it is increasingly utilized in high forage diets of growing ruminants. Potential hazards of feeding animal waste to livestock and processing and handling methods to make poultry waste safe are discussed in detail. Crop residues are low quality roughages which, other than being low in desirable chemical constitutes, their utilization is limited by low voluntary intake and digestibility. To enhance their utilization treatments such as alkali treatments, silage making and feeding the residues with other

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supplementary feeds are discussed in detail. Browse trees and shrubs and ley grasses are integrated components in the agropastoral production systems. However, use of browse is limited to the presence of tannins and other phenolics while ley grasses require appropriate agronomic practices to realize their potential.

Thus, use of non-conventional nitrogen sources such as animal waste and other nitrogenous sources like browse should be integrated into the agropastoral production systems.

**Introduction**

The agropastoral and pastoral production systems are predominantly confined to the semi-arid and arid eco-zones, respectively. Their main emphasis is livestock production, mainly based on grazing on natural forage. However, with increasing human population pressure, most of the high potential range areas have been taken up for crop production, and the agropastoral and pastoral production systems have become increasingly marginalized to very arid areas where forage production is limited by acute shortage of precipitation. Hence, these systems are becoming unsustainable, land degradation through overgrazing is evident, and the pastoral peoples' livelihood are at risk.

To restore environmental security, and meet the people's livelihood, these production systems must be enhanced so as to support livestock and livestock products production on a sustainable basis. Integration of non-conventional feed resources to these grazier-based production systems offers the only feasible
option of stabilizing livestock production and enhancing a continuous supply of livestock products.

The non-conventional feeds of choice should supply critical nutrients mainly nitrogen, energy and some minerals that are particularly deficient in natural forages during the critical seasons of grazing. Animal wastes, crop residues, ley grasses and browse provide the best alternatives in meeting the feed supply requirements of the agropastoral production systems.

**Animal Wastes**

Animal wastes particularly poultry and cattle wastes are increasingly becoming important in ruminant nutrition. They are used as total or partial substitutes for forage as sources of nutrients for ruminants. It is estimated that animal waste could provide as much as 40% reduction in feed production costs.

Poultry waste has been used extensively in Kenya, particularly by small scale farmers in the high potential areas, as a protein supplement for domestic ruminants. Previously, poultry waste had been mainly used as farmyard manure and, with cattle, sheep and goat manure being more popular and abundant, only a fraction of it went to this use, and the rest was left to decay. Moreover, Smith and Wheeler (1979) reported that poultry waste was 3 to 10 times more valuable as a protein source than as a plant nitrogen source for various classes of ruminant animals, and that the nitrogen in poultry waste was utilized more effectively in high forage diets of growing ruminants than cow dung and pig excrete.
Nyangito (1995) reported that when small African goats on low quality range hay were supplemented with different poultry waste-grain sorghum ratios, dry-matter intake increased with higher levels of poultry waste (11.8 to 12.6 g Dm/kg W.75). Nutrient digestibility coefficients of DM, CP, NDF, ADF and GE increased with higher levels of poultry waste and the animals attained a positive nitrogen balance status. This study demonstrated that poultry waste can improve the plane of nutrition of animals on low quality natural forages. Similar findings have been reported by Gihad (1976), Smith and Lindahl (1977) and Thomas et al. (1972).

These positive effects of poultry waste on dry-matter intake and nutrient digestibility were attributed to the corresponding increase in CP contents of the diets. High protein diets supply adequate nitrogen for rumen microbial growth. High rumen microbial population is, in turn, associated with high rumen fermentative capacity that leads to high digestibility of the ingesta and rumen turn-over.

Unlike other animal wastes, poultry waste is rich in nitrogen and minerals (table 3).

| Table 3. Chemical composition (on DM basis) of poultry waste |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| DM  | CP  | ASH  | NDF  | ADF  | ADL  | Ca  | P   | K   | Mg  | Fe  | Zn  | Cu  | Na  | Ge  |
| %   | ppm | Kcal/g |
| 86.9 | 15.8 | 21.5 | 46.4 | 22.8 | 2.7 | 4.3 | 0.7 | 1.6 | 0.9 | 1187 | 178 | 25 | 722 | 4.0 |

Source: NYANGITO, 1995
It is estimated that chicken produce about 34g of waste per day (Muinga et al. 1985). With a total poultry population of 7.7 million in Kenya (MOA 1990), then about 95,557 tons of poultry waste is produced annually. This vast resource, that is relatively cheap, could contribute significantly to the agropastoral systems if made available. For practical feeding purposes, an inclusion rate not exceeding one-third of the diet is recommended.

There are potential hazards in feeding animal waste to livestock. Some of the hazards include: pathogenic bacteria (E. coli, Staphylococcus spp. etc.), moulds, harmful pesticide residues, medicinal drugs and heavy metals (Smith et al. 1975; Angus et al. 1976; Kinzel et al. 1983), and odour (Fianu et al. 1984). However, with adequate processing and handling, poultry waste can be reasonably rendered free of pathogens, medicants and odour. Methods of processing poultry waste that have been shown to eliminate potential poisoning include: air drying, autoclaving, chemical treatment, ensiling and composting. Best results on pathogen control have been obtained with autoclaving, followed by oven drying and open-air drying (Fianu et al. 1984; Nambi 1987), respectively. Sun and shade drying are more effective in odour control than oven drying and autoclaving (Fianu et al. 1984). However, high nitrogen losses are reported with sun drying, air drying and oven drying than autoclaving. This is attributed to the rapid generation of ammonia from uric acid, which constitutes 60-70% of the nitrogen in poultry waste (Bhattacharya and Taylor 1975). Fianu et al. (1984) concluded that, despite the high nitrogen losses associated with air drying methods, their low operation costs and effectiveness in controlling bacteria and odour renders them most practical to most farmers.
The only documented potential problem with poultry waste in animal health is copper toxicity particularly in sheep (Fontenot et al. 1971). This may not be a serious problem with other farm animals which are not sensitive to high dietary copper.

**Crop Residues**

These are low quality roughages. They are high in lignocellulosic cell wall materials and low in energy but also low in readily available carbohydrate such as sugars, starch and fructans as well as nitrogen and certain minerals, particularly calcium and phosphorus. Moreover, phytic acid may be present in these residues and is found to play a negative role by binding important minerals such as P, Ca, Mg, Fe & Cu. In the agropastoral systems, these residues are found in large amounts, residues such as straws (rice, wheat and barley), stovers (maize, sorghum and millets) and sugar cane baggage.

Table 4: Chemical composition of some common crop residues.

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<th></th>
<th>DM Ash</th>
<th>CP</th>
<th>CF</th>
<th>EE</th>
<th>NFE</th>
<th>Hem</th>
<th>Cell</th>
<th>Lign</th>
<th>Ins</th>
<th>Flc</th>
<th>ash &amp; si</th>
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<tbody>
<tr>
<td>Maize</td>
<td>93.3</td>
<td>12.1</td>
<td>2.3</td>
<td>45.3</td>
<td>1.83</td>
<td>38.4</td>
<td>23.6</td>
<td>42.5</td>
<td>6.98</td>
<td>5.04</td>
<td>74.1</td>
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<td>stover</td>
<td></td>
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<tr>
<td>Rice</td>
<td>94.9</td>
<td>24.0</td>
<td>3.8</td>
<td>41.1</td>
<td>1.78</td>
<td>29.4</td>
<td>13.0</td>
<td>39.5</td>
<td>6.26</td>
<td>12.3</td>
<td>58.9</td>
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<tr>
<td>straw</td>
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<tr>
<td>Wheat</td>
<td>91.5</td>
<td>10.4</td>
<td>4.0</td>
<td>36.0</td>
<td>2.68</td>
<td>46.9</td>
<td>12.1</td>
<td>42.2</td>
<td>11.9</td>
<td>5.8</td>
<td>66.2</td>
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<td>straw</td>
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*FIC - FULL LIGNOCELLULUSB CONTENT

Source: MUSIMBA (1981)
This chemical composition status of the residues is anticipated as crops mature, the digestible components of protein and soluble carbohydrates are translocated from the leaves and stems to the seeds, leaving the more fibrous structural cell-wall material to increase and accumulate in the stems and leaves.

Other than the low content of desirable chemical constitutes, utilization of the residues is further limited by low voluntary intake and digestibility. Low digestibility is associated with the high lignin and silica content. These are encrusting substances that are resistant to microbial digestion in the rumen. Hence, the structural carbohydrates - cellulose and hemicellulose that are embedded in the ligno-silica matrix of plant cell walls - are protected from enzymatic hydrolysis of the micro-organisms and are associated with low digestibility. Moreover, these structural carbohydrates have a complex structure (i.e. cellulose is a polymer of B-1,4-linked glucose units and is largely crystalline, forming flat, ribbon-like micro fibrils while hemicellulose is a polymer of xylose units with small constituents of glucose, galactose, mannose, pectic substances such as galacturonic acid, arabinose and rhamnose) that is not easily attacked by the rumen micro-organisms digestive enzymes.

Utilization of these materials can be enhanced by increasing accessibility of their cell-wall structural components to microbial and enzymatic hydrolysis. This can be achieved by treatments that increase the surface area, make cellulose less crystalline, more swollen or less affected by components such as lignin and silica. The following treatments have been used to varying degrees of success:
(i) **Alkali treatments:** The straws/stovers are washed in alkali, mainly in sodium hydroxide. The alkali cleaves the lignin/hemicellulose linkages, saponifies the ester linkages between acetic acid and phenolic acids of polysaccharides; it also enhances swelling of the cell walls, thus allowing greater diffusion of cellulolytic enzymes and it solubilizes some parts of hemicellulose, proteins, lignin and silica. Consequently, alkali treatment leads to increased digestibility and release of nutrients from the straws/stovers in the ruminants. However, this treatment is costly and may not be widely used by poor agropastoralists.

(ii) **Silage making:** In this process, the crop residues are turned into silage. Silage making aims at preserving the nutrients in the feed material, minimizing nutrient loss and providing a palatable feed. In this process, the material undergoes anaerobic fermentation in the silo. Here, the anaerobes break down the sugars in the ensiled feeds to derive their own energy. At the same time, organic acids are produced, predominantly lactic acid, which when it accumulates to a certain concentration, arrests further microbial action and preserves the fermented feeds. Also during this process, heat is produced, causing a temperature rise in the silo. For good silage making, the temperature should rise and be between 85°F-120°F.

Factors that affect good silage making include:
(1) state of maturity of the crop,
(2) moisture content of the material being ensiled,
(3) degree of material compaction in the silo,
(4) rate of filling up the silo,
(5) size of pieces of material being ensiled and
availability of carbohydrates for bacterial growth.

The state of maturity affects the carbohydrate and moisture content of the material being ensiled. In respect to crop residues, they are high in structural carbohydrates and low in moisture content. Such materials are suitable for silage making as the high carbohydrate content provides sufficient energy for bacterial growth and attack. These materials are likely to generate more heat and raise the silo temperatures beyond the desired range that may result in overheating and composting. Hence, during the ensiling process, water should be sprinkled into the material at a rate of 20-30 gallons per ton of material to absorb the excess heat produced, thus lowering silo temperatures to the desired range. High degree of material consolidation in the silo should be achieved to exclude air for effective anaerobic fermentation. Thus, the materials should be chopped to short lengths to facilitate compaction. Also, the rate of filling the silo should be such that air is excluded and appropriate temperatures are attained during the ensiling process. The silo should be filled to 3 ft and left for 48 hours before further filling up. This allows for a better temperature establishment. In effect, the temperature should rise within 12 to 29 hours of ensiling and continue for the next 4 days, then remain constant for a day before dropping slowly for the next 3 weeks to the surrounding soil temperature.

In general, to reduce unfavorable silo temperatures, speed up the rate of ensiling, increase the level of compaction, add water and incorporate immature materials of high moisture content. Conversely to increase temperature to the ideal range, slow the rate of ensiling, reduce the level of compaction, wilt the crop to reduce
the moisture content before ensiling, add materials of low moisture content or add molasses to increase the carbohydrate content at a rate of 2 gallons (+2 gallons of water) per ton of material. Good silage should be ready for use within a month of ensiling. This treatment is relatively low in cost and can be practised by all categories of agropastoralists.

(iii) Feeding the residues with other supplementary feeds:

Feeding of nitrogen supplements enhances the rumen cellulolytic activity, hence nutrient digestibility and high rumen turn-over. This will enhance the utilization of the poor quality residues that are low in nitrogen content. Conversely, feeding high energy concentrates has a depressing effect on roughage digestibility and consequently utilization. Thus, use of non conventional nitrogen sources such as animal waste and other nitrogenous sources like browse should be integrated into the agropastoral production systems.

Browse

Browse trees and shrubs are a common feature in areas suitable for agropastoral production systems. They provide protein, vitamins and often mineral elements which are lacking in grassland pastures during the dry season and/or cold season. They also allow a standing feed reserve to be built up so that herds are able to survive critical periods of shortfall or prolonged drought without losses. Moreover, browse provides an effective means of utilizing marginal land on which crop production is ineffective owing to climatic,
topographic or edaphic constraints. In the agropastoral systems, browse trees should be maintained as woodlots or woodland belts or as hedgerows. Their use is enhanced by integrating such practices like coppicing and lopping so that the animals can easily access the forage. However, use of browse is limited by the presence of tannins and other phenolics. These compounds lower the nutritive value of browse by toxic effects on the animals or through enzyme inhibition and substrate binding in the digestive tract.

In the agropastoral systems, the browse plants should be distributed to meet the requirements of cultivation and animal requirements. This necessitates the use of appropriate spacings, protection of young seedlings, multiplication of desirable species and destruction of undesirable species. Some of the important browse species include: *Acacia* spp, *Grewia bicolar*, *Balanites aegyptiaca*, *Maerua crassifolia*, *Calliandra* spp, *Leucaena leucocephala*, etc.

**Ley Grasses**

These offer great potential for the agropastoral production systems. They are of high nutritive value and are high yielding. However, they require appropriate agronomic practices to realize their potential. Those that are promising include: napier grass, *Panicum maximum*, *Brachiaria decumbens*, *Brachiaria humidicola* and *Hyparrhenia rufa*. They are best utilized as green chop.
References


Le Houe'rou, H. N. (1980.) Browse in Africa. The current state of knowledge. ILCA.


7. SUMMARY OF SUPPORTIVE PAPERS

Food Security and Nutrition in Agro-pastoral Production Systems - Perceptions and Practices: The Case of Kibwezi Region

S.M. Kilobia

Food security means access by all people at all times to the food needed for an active and healthy life. At household level, access can either be from its own production or through purchasing. To improve the nutritional status of an individual, food security, his needs, variety, quality and safety of food, and his health status must be considered. Household access to food can either be chronic or transitory depending on failure in production systems, lack of purchasing power, transport problems, natural disasters and other adverse circumstances.

Kilobia summarizes the factors which affect food security and nutrition in Kibwezi which is ASAL, and with harsh and complex environment, and is susceptible to destruction, frequent crop failure and drought/famine brought about by erratic rainfall, inadequate resources and production diversification, unemployment, high human population, unsuitable technologies, lack of extension services and supportive institution, environmental degradation, communication problem and ignorance of ITK by development agents. These lead to hunger and starvation, stunting and wasting, effects of which is poor child growth and development.
The author gives the challenges and recommendations for possible interventions which include solution of the above problems. This depends to a large extent on quality of human resources and their ability to absorb and use modern technology.

**Animal health and disease control strategies and constraints: A Case of Kibwezi Division, Kenya**

*Dr. Nyaga*

Participants in the delivery of animal health and disease control services in Kibwezi Division include: vet officers and animal health assistants from the Ministry of Agriculture and Livestock Development and Marketing; graduates from veterinary institutions; community animal health workers (Wasaidizi) and individual farmers themselves.

Although indigenous cattle and local sheep and goat breeds which are resistant and/or tolerant to a number of host diseases are kept, several diseases are important in the region. They include: trypanosomiasis, tick borne diseases such as anaplasmosis and babesiosis, neonatal pneumonia/diarrhoea, malnutrition and helminthiasis. Other important diseases though not yet observed are contagious caprine pleuro-pneumonia (CCPP), contagious bovine pleuro-pneumonia (CBPP), foot and mouth diseases, rinderpest and new castle disease.
Disease control strategies and programmes include: vaccinations against rinderpest, contagious bovine pleuro-pneumonia, contagious caprine pleuro-pneumonia, new castle disease and trypanosomiasis, provision of extension services, regulation of stock movement (quarantines), and tick control through dipping.

Constraints to animal health and disease control strategies according to Nyaga are: lack of enough qualified staff with wide scope in animal diseases, lack of adequate and failure of vaccination campaigns, lack of adequate extension services, high cost of drugs such as acaricides, lack of suitable animal shelter and lack of water due to frequent droughts.

**Farming systems research in agro-pastoral production systems: Experiences from NRRC - Kiboko KARI**

*C.O. Ahuya*

In low potential areas, survival is the main priority of a small holder and agro-pastoral systems practised include keeping livestock and crop farming which are complementary; hence, their farms are operated as systems. Farming systems research (FSR) is the application of a systems perspective in identifying technologies for location specific farm situations. Farming systems approach should bring the farmers, extension workers and researchers together in the process of identification and prioritization of the farmers' problems and should give consideration to existing systems for the technology
to be of any benefit to the farmers. This paper has discussed in depth the importance of the farming systems approach, sources of variation and a sequence of carrying out problem identification using FSR from small-holders' points of view.

Experiences at NRRC - Kiboko revealed that most of the farmers kept indigenous livestock (both small and large zebus). The zebus were mainly unimproved Borans introduced from Kitui District and small herds of Sahiwal from Kajiado. The reasons why most farmers prefer keeping large zebus and problems associated with them are discussed in detail. The conclusion drawn from this study is that the indigenous small East African Zebu has a great potential for improvement given the wide variations between and among parameters that were studied. Most farmers believe that the environment is too harsh for exotic taurus breed and therefore are not keen in keeping grade cattle.