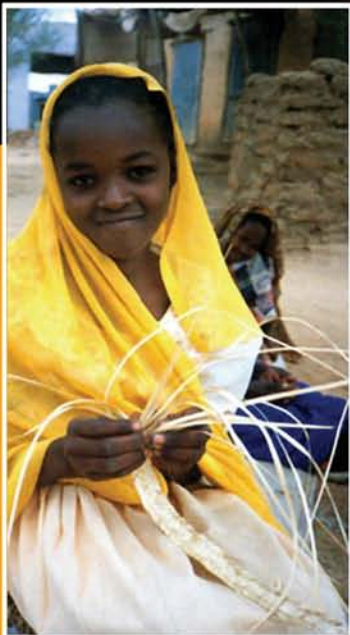


Promoting Local Innovation in Sudan

PROLINNOVA
Sudan
PRoMoting Local INNOVAtion
in ecologically-oriented agriculture and natural resource management



براکتیکیال آکشن
PRACTICAL ACTION
Intermediate Technology Development Group



**LOCAL INNOVATIONS AND INDIGENOUS
PRACTICES FROM THE SUDAN
THE HIDDEN POWER OF THE POOR**

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AND

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March, 2007

“Anyone may use the innovations described here and modify or develop them further, provided that the modified or further developed innovations or any follow-up innovations, of which any of the innovations described here are an element, are likewise freely available and any description of them includes this proviso and acknowledges the source of information.”

Acknowledgement

Working with indigenous people and their local innovations is perpetual. It is a continuous process led by professionals, partners, representatives of local authorities, the NGO Practical Action, PROLINNOVA and the people in their communities spreading all over the country. It is a circle of experiences, practices and knowledge gained, expressed, documented, published and implemented.

Many people contributed to this work; some have been acknowledged in the text as organizations, others have been listed in the contribution list, while many of the indigenous people who provided the substance of innovations all over Sudan deserve special thanks. Those people, farmers, pastoralists, craftsmen, blacksmiths, herbal healers and others who willingly gave everything they knew about innovations they had implemented which had in some way helped to improve the standard of living. They supplied the stones and bricks of this publication, we only made the cement.

Practical Action, PROLINNOVA and State Authorities were to be acknowledged for the finance, guidance, encouragement and support to bring this publication into existence. Special thanks go to Dr. Jean – Marie Diop for his valuable insight review of the draft and Mr. Liam Morgan who edited the language and sequence of the draft.

While real efforts were exerted to avoid duplication or confusion, we admit that information may not be complete or comprehensive; we take the blame for that and hope to be corrected by our avid readers.

We remain fully engorged by local innovations and innovative communities and remain committed to contribute to disseminate knowledge without boundaries.

Forward

The outpouring of love and help by local innovation families and their local communities is heart-warming. Despite shocking injuries, much suffering and hardships, local people maintained their efforts to produce innovations and never gave up their determination to provide food, health services and fun for the poor and the poorest. This is a great role model for the youth of today to be innovative, problem solvers and decision-makers. Local innovations provide an example of a caring community to make this world a better place for young and old and for poor and rich alike.

This publication is meant to stimulate all community members to actively promote the sharing of new ideas, experiences and innovations to reach a wider audience. We believe that lack of money need not be a hindrance to these objectives. It is willingness and dedication that counts.

Practical Action, its partners and sister organizations are committed to the local people and their innovations to combat poverty and ignorance through discovering and improving community-based knowledge, experience and innovations.

This is a call to all to share with us our commitment to shape the world the way we want it to be, peaceful, caring and beautiful.

Mohamed Majzoub Fideil
Country Director
Practical Action – Sudan

Chapter (1)

Introduction

The Sudanese "top down" approach has been widely analyzed in both national and international circles and the relevant literature is quantitatively impressive. However, due to the difficulties of field work research in Sudan, many recent studies lack the deep understanding of the local and regional societies at their grass root levels. Among the many gaps identified are the local innovations made by the indigenous people to sustain livelihood, security and development. These gaps in local and regional innovation understanding represent vast areas whose history remain little known to the international community. Therefore the aims of this publication are to focus on:

- a) Collection and classification of Sudanese local innovations using a "bottom-up" approach.
- b) To take into account the historical depth and the potential use that may highlight the continuity and changes in local innovations as indicators of society transformation.
- c) To adapt and adopt as far as possible a multidisciplinary approach showing the interaction between the different processes of local innovations and the potential for dissemination. The multidisciplinary approach and the chain of innovation processes are not yet well developed in the Sudan. In fact participatory approaches and detailing the structure and sequence of innovation processes was taken up from PROLINNOVA concepts, guidelines and experiences.

The theme of this work is to bring to the surface the community knowledge, practices and experiences as reflectors of their efforts on the road to social welfare and economic development.

By bringing local innovations to the surface, it is hoped that a national integration programme can be developed to breach the gaps between local communities in sharing the benefits of local innovations. Moreover, it is an effort to stimulate regional and international partners to examine these innovations and build with these communities a framework for action to maximize the benefits and minimize the losses and to exchange innovative ideas whenever possible.

Many inspirations, new ideas and potential innovations, when examined under the light of day are found to face serious practical barriers to their implementation and dissemination. Brilliant ideas for innovative products and technologies can be so far ahead of their time that even a commonly understood terminology for communicating them may be lacking.

This observation can be said about science-based innovations. However, the community-based innovations face more barriers than ever could have been imagined. For brainstorming old ideas and innovations and bringing those to market in short time, researchers and business professionals need to address critically the issues of local innovations as a fermentor of new products, services and social conduct.

The overall objective of this publication is to throw a stone in the stagnant waters of local innovations in the Sudan, in a process of turning these innovations into manufacturable and marketable forms to contribute to poverty reduction and to reduce the gap between the poor and the rich within the community and at the national level.

Today, the need for local innovation is being recognized not only in business and academic circles but also by the world's political and economic leaders as indicated in their choice of conclusive remarks:

"It is imperative to learn how to unleash our innovative potential to tackle the world's problems" (Economic Forum, Johannesburg 2006).

Democratizing local innovations can not flourish in the absence of good governance from the lowest to the highest level. Indigenous people and their local innovations can contribute to and lead to better democracy. Improvement in the level of understanding, apprehension and living standards can not happen where people cannot participate in structuring their needs and potentials. The democracy we advocate for, in this publication, is a homemade commitment to better life expressed in basic human rights, flow and exchange of information and cooperation with the concerned international communities.

Local innovations, if well focused on, can provide an effective tool towards ensuring parity, equitable distribution of wealth, social justice and freedom of expression of thoughts and innovations. This

can be observed clearly if we know that most of the local innovations were not owned by individuals and their impacts are usually higher than their production costs. These innovations reduce human efforts, create employment, improve horizontal and vertical productivity and moreover they are environmentally friendly.

We hope that this publication will send a message to local innovators, business communities and researchers that there is a place for their efforts and there is much money and prosperity awaiting them.

Chapter (2)

Sudan Diversity: The substance of local innovations

Introduction:

Human settlements in their search for better security, better livelihood and better services are faced with multi faceted difficulties. In the continuous search for this betterment knowledge, experience and technologies were developed and used. Access to these developments was hindered by many political, economic and social internal and external factors.

The African farmer and the Sudanese farmer as well, confronted by the lack of assets, lack of capital and limited basic education took the challenge by developing his own system of innovation making use of the existing advantages and disadvantages of nature around him. He used the diversities as subsistence of his indigenous knowledge and local innovation. The aims of these efforts were to solve the problems he faces, grasp the application of the solution and seek experience from accessible areas that suits his needs.

Indigenous knowledge, practice and innovation are created by individuals, groups or inherited from ancestors. The need for the process of local innovation is simply to solve existing problems or to satisfy urgent needs or to grasp opportunities. However, problems can not be solved permanently in a rapidly changing environment. Today's solutions are tomorrow's problems and therefore new solutions are needed. This explains the different versions – or applications – of a single basic innovation or practice due to changes in factors constituting the problem or the need.

Most of the innovations are not recorded or documented. They are kept by heart and transmitted from generation to generation. As most of the innovations involve crafts and skills these innovations were transmitted to their sons and relatives in absence of systemic education taking care of innovations. Information about the starting date or the detailed development in processes is difficult to obtain.

Since local innovations and practices were built on the indigenous knowledge of communities, there is no purposive intension to create it, protect it or label it as an individual property. This situation does not allow for tracing the innovation to bring it to its first innovator.

Again, most of the captured innovations and practices, at this stage, do not tell much about how the innovators did go about it. What was recalled was from discussions using trial and error, doing this as they were inherited or making use of other community practices that proved to be productive.

Diversity in Location

Sudan is the largest country in Africa and the tenth in the world. Its total area is estimated at 2,505,800 square kilometers. As wide as it is, it has nine neighbouring countries, Egypt in the north, Eritrea and Ethiopia in the East, Kenya, Uganda and Democratic Republic of Congo in the South, Central African Republic, Chad and Libya in the West. The red Sea extends over 750km in the East, while the River Nile and its tributaries (mainly White and Blue Niles) cross the country from South to North.

Population Diversity

The total population is estimated at 36.2 (2005) including Arabs, Africans, and crosses between the two. Anthropologists and social scientists had identified more than a hundred languages and dialects that are used by the Sudanese. This encompasses more than fifty groups and six hundred tribes of variable sizes. (Sudan Embassy Website, South Africa). Arabic and English languages are the dominant and official languages. A mixture of Arabic and African languages is widely used in Southern Sudan.

Ecological Diversity

The Sudan represents most of the ecological zones of Africa. It has desert, semi-desert, poor savannah, rich savanna, tropical swampy regions and a coastal zone along the East. It also has a series of mountains (Nuba, Jebel Mara, Kawra and Amatong) extending along more than 500km in the west and another series of mountains that follow the coastal banks of the Red Sea.

The types and quality of soils range considerably, from sandy, gravel, coarse and fine to cracking, clay and muddy. The vegetation cover follows closely the type of soil and the amount of rainfall it receives which varies from less than 100ml in the North to over 800ml in the South.

The daily and seasonal temperature variations are high. The difference in day and night temperatures can reach up to 20C. Maximum Summer temperature can reach 46C and minimum winter temperature may be as low as 5C. The length of the rainy season may be as short as three months in the North and as long as six months in the South. Variation in the quantity (coverage) and the quality (amount and distribution) of the rain fall is so great that it is becoming a major threat to livelihood and a real concern to development economists.

Biological Diversity

a) Wild Fauna and Flora Diversity

The ecological and climatic diversity created an optimal environment for a variety of wild animals and plants. Sudan is rich in wildlife of most of the families and species of large mammalian herbivores and carnivores, birds, reptiles, insects, aquatic (marine and fresh water) and microorganisms. The wild fauna range from pasture, plants, forests and mangroves to flowers, cosmetic and medical herbs.

b) Agricultural Diversity

Agriculture is the backbone of the Sudan economy. More than 70% of the population is engaged in agriculture directly or indirectly. It

accounts for 40% of GDP (2001). Agriculture in the Sudan is either irrigated mechanically or traditionally rain fed. Sudanese farmers produce sorghum, millet, wheat, vegetables as food crops and produce cotton, gum Arabic, groundnuts, sesame, fruits, spices as cash crops and many other leguminous crops for food and fodder. Sudan is self-sufficient in agricultural products but the problems lie in accessibility and affordability. Traditional and subsistence agriculture is the main concern to development workers since more than 70% of the population is depending on it.

c) Livestock Diversity

Sudan has the largest inventory of livestock in the Arab and African worlds with estimates of 35 million cattle, 35 million sheep, 45 million goats, 3 million camels and 1.5 million equines and an unestimated number of poultry ranging from backyard to commercial farms. Sudan is also self-sufficient in livestock and livestock byproducts. However, due to infrastructural constraints Sudan imports 30% of its dairy requirements.

Most of the agricultural production is produced by the rural community and indigenous people. Multi-national or large scale commercial farms are to date, of low impact on the economy, employment or livelihood.

River and marine fisheries diversity

Fishes of the Nile, its tributaries, the Red Sea and the lakes represent one of the natural resources of the Southern, Eastern and Central Sudan. Although the resources are abundant the utilization is far below the optimal requirements. Many of the experts believe

that there is a need for infrastructural development and capacity building to take more advantage of the estimated 300 species of fish.

Forestry Diversity

Most of the Sudan forest wood is tropical. Forests of the Sudan represent the major source of energy for the rural communities and they also produce wood for building and furniture. Forest diversity is at high risk due to civil war, droughts and illegal cutting. Non-wood forest products are used extensively for food, drink and medicine.

Cultural Diversity

The above listed diversities created and shaped a prominent human diversity in all aspects of life. In terms of religion Sudan is made up of 60% Muslims, around 30% Christians and a third minority is pagan with their own traditional beliefs. The three groups share in common a strong belief in destiny, life after death and good faith.

The way of livelihood is also diverse, governed by what nature provided to them and what they and their ancestors know adapting themselves to the total environment. Tribal relations are strong and act as a defense mechanism against the different types of threats and enemies¹. Each of these ethnic groups worked out through time and experiences a behavioural package shown by their distinctive housing, cooking, dresses, makeup, festivals, raising of children, marriage and folklore. Most of these distinct activities are still present while others faded away without documentation.

¹ Al Hassan, I.S. (2007) Issues of Cultural Diversity in Sudan. Afkar jadeeda No. 17. PP21-36.

Chapter (3)

The History of Local Innovations and Indigenous Practices in Sudan Endurance and Progressive Development through the Ages

He who forgets his past is lost (Sudanese Proverb)

The present "Sudan" is a fabric of history, environment and endurance. Sudan meaning "the black" has maintained its name in all languages through its development. The recorded history goes back as far as 4000 BCE. Many experts view Sudan as the father of civilization in Africa. The archeology to support that is present today from Sennar (Central Sudan) to the boundaries with Egypt (Northern Sudan).

The Sudanese built 335 pyramids long before the famous Egyptian pyramids. Sudanese pyramids are simple and small indicating the first experience of pyramid building. These pyramids stand as strong material evidence of local innovations of the ancestors. Those people, at those times, built the first stones for architecture and engineering sciences. They believed in life after death, in dignified death and more over in showing beauty in the paintings they printed and in the arts standing today as they were made six millenniums back (Sudan Museum notes).

Water harvesting mechanisms and terrace making (step agriculture), dated as far back as 2000 BCE are still standing today 150km North of Khartoum. Again they were reported to be the first

innovators of the pulley and gear mechanics using the mechanical advantage known as the Sagia pump.

Animal drawn ploughs and carts stand as further evidence for the social and economic relationships between man and animals in festivals and at work. Those people believed, furthermore, in the holy animals and in the sacrifice of animals in breaching their Gods.

The weighing scales are first seen in the drawings of the Sudanese pharos as an indicator of justice and a means of trade (Harvard University Museum). They used these scales particularly for assessing the Nobel metals like gold, silver and other precious stones. They brought the knowledge and the value of these metals to the world. Those were only the cardinal signs of local innovations in Sudan.

The "present" indigenous people of Sudan came to Sudan from the West (Arabs and Africans), from the East, from the South and from the North. Some others came from further a field such as Turkey, Persia and India. In the past Sudan experienced these migrations as a relatively more attractive and peaceful country. People knew how to live together and how to share benefits, nomadism, pastoralism, subsistence agriculture and petty trade were the dominant common factors. Traditional religions, Christianity and Islam lived together and interacted in social behaviour and common social laws.

The "Western" culture came to Sudan in 1885 with the British colonization. This culture was manifested in state management and administration, introducing infrastructure and agricultural projects, education and the English language. At this time an international window was opened with much of these technologies being adopted and local innovations were implemented on a large scale. Demographic homogenization took place within mutually agreed unwritten social contracts. Dissemination of locally innovated agricultural and animal husbandry tools was at its maximum.

With the introduction of Western technologies (soft and hard) a new generation of local innovations combined with advanced technologies was stimulated. Such innovations included domestic energy supply, reducing human and animal physical efforts, use of improved locally produced seeds, changes in food storage and food habits, improved sanitation of habitat etc.

At present the telecommunication and information revolution mastered and controlled to a certain extent the flow of local innovations. However, the human capacity levels and the affordability to access the technological products may be far beyond the reach of the poor. The challenge facing the new local innovators is to strike a balance between efficiency (high tech) and affordability (low cost).

Chapter (4)

Practical Action and the PROLINNOVA program in Sudan

Practical Action

Practical Action is a British charity organization established in 1966 by the famous economist E. F. Schumacher, author of *Small is Beautiful*. Practical Action is working with small-scale producers through local offices and partners in Peru, Sudan, Zimbabwe, Kenya, Sri Lanka, Bangladesh, Nepal and the UK to find practical, long-lasting ways of overcoming poverty. It works alongside communities to build their knowledge, skills and access to affordable technology for transport, growing food, generating income, producing energy and coping with disasters.

Mission Statement

“To use technology to challenge poverty by:

- Building the capabilities of poor people,
- Improving their access to technical options and knowledge.
- Working with them to influence social, economic and institutional systems for innovation and the use of technology”.

Practical Action – Sudan Office

Practical Action has been present in Sudan since the mid seventies when it was providing technical assistance to the regional government in Southern Sudan on building reinforced cement boats. In 1987 Intermediate Technology Development Group ITDG (as Practical Action was formally known) provided technical assistance to Oxfam’s Kebkabiya Small Holders programme in

North Darfur at the extreme west of Sudan. In December 1992 the ITDG Sudan office was officially opened and accordingly an Integrated Technology programme was developed in Eastern Sudan in addition to the North Darfur programme. Recently two offices were opened in North Kordofan and the Blue Nile.

PROLINNOVA and Practical Action in Sudan

PROLINNOVA is an NGO initiated program to build a global learning and advocacy network on promoting local innovation in ecologically oriented agriculture and natural resource management (NRM). The focus is on recognizing the dynamics of indigenous knowledge (IK) and learning how to strengthen the capacities of farmers to adjust to changing conditions. Allowing them to develop and adapt their own site-appropriate systems and institutions of resource management in order to gain food security, sustain their livelihoods and safeguard the environment.

As already said, Sudan is the largest country in Africa with a total area of about 2.5 million square kilometers. The country extends between latitudes 23°10' N and longitudes 24°38' E. From the north to the south, the country could generally be divided into three major ecological zones namely: desert, savannah and tropical forests. The unique location of the country and the wonderful diversity make Sudan one of the best locations for the **PROLINNOVA** program.

The Program in Sudan aims at building and strengthening partnerships between the different stakeholders involved in agriculture, NRM, agricultural research and development in the

country. Practical Action Sudan Office is the coordinating NGO for the start-up phase of the Program. The preparatory work started in 2004 by contacting the concerned government institutions; the Technology Transfer and Extension Administration (TTEA) and the Agricultural Research and Technology Corporation (ARTC). Practical Action, TTEA and ARTC agreed to form a National Steering Committee (NSC) to lead the overall strategic direction of the Program. In April 2004, the NSC was formed with eleven members. The programme in Sudan was actually started in 2005.

Achievements up to May 2007

- 1)** PROLINNOVA Program has been introduced to stakeholders in 5 regions namely North Darfur (El Fashir), Kordofan (El Obied), Eastern Sudan (Kassala), Central Sudan (Sinja) and Northern Sudan (Dongola)
- 2)** PROLINNOVA Country Coordinator and one member of the National Steering committee attended the 2nd PROLINNOVA International Partner's Workshop held in Cambodia during March 2006.
- 3)** PROLINNOVA Country Coordinator attended the PID Forum in Kampala, Uganda in July 2006.
- 4)** One of the NSC members attended the Campaign, Advocacy and Lobbying training workshop held in Bagamoyo, Tanzania, in August 2006.
- 5)** The 1st Participatory Innovation Development (PID) training workshop in Sudan was held in El Obied, capital town of North Kordofan at the end of 2006. The training workshop was implemented in coordination and collaboration with the State

Technology Transfer and Extension Administration and the Western Sudan Resources Management Program (a government program funded by IFAD). Thirty Participants were selected from North and South Kordofan, North Darfur, El Shamalia State and Kassala State.

6) The second PID training workshop was organized in collaboration with the ARC in Wad Madani in early 2007. Invitations to the workshop were extended to 25 researches, academics and development workers in the Blue Nile, Sinnja, the White Nile and the Gazeera States.

7) PROLINNOVA Country Coordinator and one member of the ARC in Dongola attended the 3rd PROLINNOVA International Partner's Workshop held in Dakar, Senegal in March 2007.

Future Aims for 2007 and beyond

A new cycle for the Program has started with the Sudan country program focusing on the following:

- Continue identification and documentation of innovations and innovators (in Blue Nile region for example).
- Continue PID training in the other regions.
- Set platforms for reflections analysis and learning about promoting local innovations (farmers-to-farmers / farmers to researchers and academics).
- Up scaling through production of posters, films, videos and written case studies for different audiences and purposes.
- Funding mechanisms for developing and promoting local innovations.

Chapter (5)

Selected Sudanese Innovations and Indigenous Practices

Introduction:

The inventory of sample innovations, practices and knowledge described in this chapter provide a host of lessons and acknowledgements to all who are occupied with promoting local innovations to serve the social, economic and development needs of the poor communities.

We know that innovative communities and individuals have to struggle with a multitude of interconnected technical, social and economic constraints, especially when target people are as a rule, poor with little infrastructure and have weak and unregulated market mechanisms. In such cases the aim of these innovations and practices is not to produce expensive sophisticated science-based technologies but rather to develop already existing practices and technologies inherited from ancestors or developed themselves. Such development is necessary to adapt experiences and knowledge to serve the local social and economic needs with affordable costs and observable impact on poor communities. Such innovations need to be cheap, simple, robust, and easy to handle and involve minimum accident risks and maximum safety.

As diversity is the theme of this publication, efforts were made to select a diverse set of innovations in different fields with different uses. This research is in no way exhaustive, its purpose is to show examples of local innovations and indigenous practices that have been produced and are being used.

PROLINNOVA and Practical Action set up a field programme to address the issues of indigenous knowledge, local innovations and practices in the Sudan. The programme followed the guiding principles and experiences of PROLINNOVA. Implementation of this programme included:-

- Visiting the five regions of Sudan (Darfur, kordofan, Northren States, eastern States and central States) and consulting the local authorities, researchers, university staff and extension workers to prepare five workshops and to call upon farmers and individuals who know about local innovations.
- Invited speakers from the five regions were requested to prepare introductory presentations to the participants.
- The floor was given to the audience to tell about his / her experience with local innovations.
- The outcomes of the five workshops were recorded and retrieved latter.
- A consultant, who is a Steering Committee member and who participated in the five workshops was requested to collect and compile the innovations and practices provided by the participants in the workshops.
- The selection criteria for inclusion in this book were discussed and approved by PROLINNOVA Country Coordinator, Practical Action Senior Staff and the core working group. These criteria were:

- Presentation of a variety of innovations covering the diversity of Sudanese innovative issues and practices.
- Bringing up a wide coverage of the country innovations.
- The innovations impact on livelihood, poverty reduction and improvement of live style.
- The potential of the innovations to be improved or modified to suit other areas with similar problems.
- The clarity and simplicity of the innovations.

Assessment of the advantages and disadvantages was made on the basis of the discussions made in the workshops and by the specialists who attended these workshops from research, universities and extension institutions.

Innovation 1: Hibiscus Harvester



Hibiscus Harvester: The Innovation

Location: Korfofan, western Sudan

Ownership: Ahmed El Mana

Reporter: Khalid El Badrabi

Background

The flower of the Roselle Hibiscus plant (known locally as 'Karkadeh') is used traditionally as a soft drink; it is now further used as a colouring agent for food, medicines and cosmetics. It has a potential of impacting up to 1.5 million farmers. It is grown by women farmers as a source of income and as an economic shock absorber. In 2004 Sudan used and exported \$28 million worth of hibiscus.



Hibiscus Flowers



Hibiscus Farmer

Ahmed Al-Mana is a farmer living in Umruwaba town in North Kordofan. He is a 'Karkadeh' grower, and because of low returns due to miss-practices forced Al-Mana to innovate a tool purposely to de-seed the 'Karkadeh' calyx. The extractor tool named 'Injaz' is identified and registered through the Ministry of Justice and the Ministry of Agriculture.



First prototype harvester

Innovation steps

When building his Hibiscus Harvester, Al-Mana designed and built a small instrument using easily accessible components, including small plain pipe, a funnel, a piece of rubber and a spring. The instrument works by springing the seed from the calyx. The spring increases the hand power therefore reducing the deformation of the calyx. Al-Mana developed the single 'Injaz' tool at a cost of SD. 800.00 about US\$4.00. In the future Al-Mana is going to develop a double 'Injaz' in which work time could be reduced by up to 50% by using two hands instead of one.

Previously in many southern areas of Kordofan, farmers of 'Karkedeh' used to split a sun-dried stem forming a Y-shape. Following this they used to put the mature 'Karkadeh' stems with in the angle of the Y-shape then pull the stem back chapping off the

calyx with its seeds and the leaves. The method is very easy but 'Karkadeh' quality is not assured.

Advantages:

The usage of the 'Injaz' allows for the seeds to be removed quickly without being damaged. Also the tool is simple to make.

Disadvantages:

Farmers need more training, mobilization and time to adopt the technique.

Innovation 2: Tokar Mesquite Eradication



Flourishing Mesquite, flowers and fruits



Mesquite Forest

Location: Eastern Sudan

Ownership: Community

Reporter: Khalid El Badrabi

Background:

The shrub Mesquite is a thorny shrub botanically named as Prosopis species. It was introduced early in the 1930's as a wind break belt north of Khartoum. Some experimentation by the forest department in the sixties was done and it subsequently approved the shrub to be disseminated to combat desertification. The shrub was sown in the most fertile soils of the Sudan, where it flourished and caused the adverse effect of being a serious pest to agriculture and a real hazard to man and animals. In the mid nineties the Ministry of Agriculture approved a law to eradicate the Mesquite shrub from the whole county without providing scientific or practical methods for doing it except for cutting and burning.

The disadvantages of the shrub:

- It colonizes the land completely giving no chance for farm crops.
- It increases the evapotranspiration leading to loss of soil moisture.
- It acts as a harbour for snakes and warthogs.
- Its thorns are sharp, hard and painful.
- The charcoal is of inferior quality.

The Process

Cutting and burning at the soil level resulted in quick and vigorous vegetative regeneration particularly when relative humidity is above average.

The farmers developed a three stage process:

- Split the stem stump vertically almost one foot.
- Pour an amount of a special Termite *Negdensis* found only in this area inside the split.
- Decorticate the trunk from top down for about 20cm.

The Result

Complete desiccation of the trunk without further regeneration.

Advantages

- Very effective.
- Simple, can be performed by individuals or in groups.
- Environmentally friendly.
- Dried off-shoots can be used as firewood.
- It involves minimum cost (man power only).

Disadvantages

- Shrubs must be treated individually.
- The quantity of termites is limited.

Innovation 3: Controlled and synchronized sheep breeding (Known locally as 'Kenan')



A Kenaned breeding Ram

Location: Western, Eastern and north Sudan.

Ownership: community.

Reporter: Abdel Hanid A. El Razig

Background:

Sudan possesses 35 million heads of sheep. Both nomads and farmers raise sheep on natural pasture and irrigated schemes which utilize either mechanical equipment or manual labour. Availability of water, feed and the weather represent factors which affect the success of the lambing season.

Lambing during the summer (April, June and July) and in the autumn (August, September, and October) can result in disaster to sheep owners. High temperature during the summer months and high reactive humidity and rains during Autumn increase lamb mortality rates, mother stress and disease susceptibility.

The 'Kenan' Process

- Sheep owners select the best wethers (mature male rams) to be used for breeding. The remaining wethers are then either sold or castrated.
- A thin cotton rope is wound around the upper part of the two testicles to press the seminal vesicle without stopping the normal blood flow to the testicles.
- As a result no semen will flow out even if the rams mount the ewes.

Advantages

- Control breeding to coincide with favorable seasonal conditions.
- If done by trained people no injury will be caused by the process.
- The process is simple, easy and fully reversible.

Disadvantages:

- If it is done by untrained people it can cause oedema of the testicles, loss of libido or even death of the ram.
- In some rare cases the tie may be loose and conception may still take place.

Innovation 4: Strategic Adaptation to Climate Change.



Encroaching sand have displaced entire communities such as the people of the village jadallah in Nile State (UNEP publication 2007)

Location: Rain fed Areas of the Sudan.

Ownership: Community

Reporter: Belgis El Asha.

Background:

The increasing number of disasters since the beginning of the 21st century and their association with climate change has become a

major concern for the international community, raising climate change issues to the top of the global agenda. Sudan is especially vulnerable to climatic changes and variability. This is due to the fact that a large portion of its livelihood economies depends on climate sensitive sectors such as agriculture and livestock leading to widespread poverty.

In Sudan the groups that are the most vulnerable to climate risks are traditional rain-fed farmers and pastoralists. During past climatic shocks such as drought and flood there has been large-scale-human suffering from hunger among these groups, resulting in forced migration from rural areas and death of their livestock. Flooding causes widespread damage in the form of destruction of property and the death of their animals.

Rainfed farmers and pastoralists are typically the hardest hit with climate-related shocks generating a chain of events that led to the disintegration and discontinuity in human habitation. The situation is exacerbated by the extreme poverty as well as the poor household income generating activities.

The Innovative Process

In many parts of Sudan, rain fed farmers and pastoralists have devised numerous kinds of coping strategies to deal with agricultural production and livestock nurturing in the face of climatic variability. The absence of support, the lack of financial resources and the many difficulties of finding suitable alternative livelihoods forced the farmers and pastoralists to use their own knowledge and practices to mitigate the effects of climate change.

They did this through a package of adaptation processes that slightly vary from region to region depending on the local characteristics and the extent of climate change. They use one or more of the following community practices:

- 1- Indigenous early warning system perceived and practiced from generation to generation. This system depended on observation of the daily temperature, wind speed and direction, presence or absence of clouds and presence or absence of some migratory birds. These observations gave them strong clues on the type, quantity distribution and times of rain to be expected.
- 2- Agriculture Calendar:
According to the previous weather forecast, communities make decisions on the types of crops they should cultivate, the date of sowing and the areas to be cultivated.
- 3- Shifting livestock species:
During good years cattle will be raised. During bad years farmers and pastoralists shift to sheep as they are more adapted to climate change than the more sensitive cattle.
- 4- Goats are the hardiest meat and milk animals. Farmers continue to keep goats in bad years and shift to sheep in good years.
- 5- Most recently and particularly in the White Nile state a crop failure due to rainfall or low prices below the production costs caused farmers and pastoralists to fatten their sheep and cattle for market.
- 6- Terrace building to capture rains for a longer time is a common indigenous practice.

7- Digging 'hafirs' (water reservoirs) is at present becoming an investment to secure water for people and livestock. Many able farmers sell water from these 'hafirs' during the summer.

Disadvantages:

- 1- Excessive water on marginal lands can cause overgrazing, grazing other people's farms and thus create conflict.
- 2- The quality of water is not controlled which results in many outbreaks of water-borne diseases.

Innovation 5: Powder Dried Fish Meal



Fish on display at Almoradah fish market-Omdurman-Sudan



A pack of dried ready Fish recipe

Location: Blue Nile, White Nile and Khartoum States.

Ownership: fish trades.

Reporter: Osman Mohamed Saeed

Background:

Fisheries and their related activities provide important sources of livelihoods for nearly three million people in Sudan (Fisheries department, 2005 paper). A large percentage of fishermen are involved in small-scale fishing operations in open water bodies including rivers, the sea as well as in fish trading, processing and related activities. The majority of fishermen can be defined as poor. The nature of their livelihoods and their living condition make them one of the poorest and most marginalized groups in the country.

In recent years, changes in the fishing sector in Sudan have increased at a faster pace than fishermen's ability to react. Their livelihood has been affected by a wide range of factors, including: (i) declining access to and availability of fish resources (ii) increasing competition for fishing grounds and in the market place (iii) undermining the traditional structures and mechanisms that used to protect fishermen's livelihoods. Fishermen find their security becoming progressively inefficient, unsustainable and weak. Their existence is under threat and their ability to meet the basic needs of life eroding, and so their poverty is increasing.

Innovation ingredients:

- Fish coming back from fish market.
- Low quality, low price fish.

The Process:

- The fish has its viscera removed, it is then de-boned, washed and cleaned.
- The fish meat is boiled in a little water, minced and air dried.
- A final oven drying is made.
- The meat is milled by machine or by mortar and pestle.
- The powder is sieved, weighed and packed in plastic packs in different sizes.

Advantages:

- Use of surplus unmarketable low quality fish.
- Provision of high quality fish meal and fish stock for human consumption.
- Employment of fishermen and distributors.
- Can be stored for a long time.
- Can be used to feed military people in the field, students in boarding houses and can be supplied to restaurants to be used as fish stock or for fish soup.

Innovation 6: Ready made food for easy use and long shelf life



A Sudanese lady packing Kisra (Sorghum with pancake)

Location: Greater Darfur States

Ownership: Community

Reporter: Awadalla Hamid

Background

Darfur is made up of two words Dar meaning land and Fur the name of the people living there, therefore Darfur is the land of the Fur. The Fur are historically pastoralists and subsistence farmers during the rainy season. They are never nomads but they exercise restricted movement of livestock within their villages and

surrounding areas. They normally grow millet, sorghum, groundnuts, sesame, water melons and recently almost all types of vegetables.

The Fur are highly vulnerable to shortage of food caused by climate change, agricultural pests, water shortage and conflict. Famine, hunger, malnutrition and parasitic infestation are almost endemic in the area. During the last forty years the area was hit by more than seven strikes of local and general famine episodes, resulting in the loss of life, livestock and agricultural assets, particularly seeds.

The Innovative Process:

Millet (or sorghum) is crushed by mortar and pestle and the bran is filtered away. The flour is mixed with water and allowed to ferment for 3-4 days. The fermented dough is allowed to dry naturally in the sun. After drying, it is again milled manually or using the milling machine. The flour is mixed with water for a second time, left to dry again in the form of balls. Then they add sesame, groundnuts, a little sugar and dates or honey if available. It is now ready to be stored or used. Before use some water or milk is added and left for about 30 minutes. It increases in size three to four times and is ready to be served.

Advantages:

- Double fermentation increases the protein content of the meal (single cell protein).
- High nutritional value with high vitamin content.
- It has 2-4 months shelf life.
- It is a good meal for everybody particularly children, old people and pregnant women.

- It can be used during famine since little amounts can serve more people.
- It is used by school children when they go to neighboring villages at the boarding house.
- It is used by travelers and farmers who stay one or more days away from home.
- Easy to make, keep and store.
- It is tasty and highly digestible.

Disadvantages:

If not given enough time to develop before consumption it might lead to bloat and digestive disturbances although most people are aware of this.

Innovation 7: Selection, breeding and propagation of local early maturing sorghum and millet varieties :



Early maturity sorghum variety

Location: traditional rain fed Areas of Sudan.

Ownership: Community.

Reporter: Ahmed Hanafi

Background:

Sorghum is the major staple food in the Sudan. All Sudanese people-irrespective of their social rank eat sorghum in its different forms. Archaeoethnobotanical studies suggest that sorghum and millet were the first cereals to be cultivated and domesticated in Sudan. The oldest sorghum seeds to be recovered by archaeologists anywhere in the world are those found in a pit at Jabel Tomat on the White Nile dating back to 245 A.D*. Sorghum is particularly

* Hamid Dirar (1994) Indigenous Fermented Foods and Beverages of the Rural Areas of the Sudan. In indigenous knowledge for sustainable development in the Sudan. Ed Medani M. Ahmed. Institute of African and Asian studies, University of Khartoum.

adapted to drought prone areas with a large variety in wild and cultivated species still found today. Global sorghum production stood at 58 million tons in 2004 and it is grown in 99 countries. Major producers are the USA, India, Nigeria, China, Mexico, Sudan and Argentina (FOA Production year book 1996 Vol. 50).

Innovation process:

Ed-Daw Mohammed Ahmed El-Ghazali, a 65 year old farmer from El-Meraihbeebea village of North Kordofan State, Sudan, has been practicing agriculture in an area that has an average annual rainfall of about 200 mm. The area is a typical semi-desert zone of North Africa and represents the Sudano-Sahelian zone south of the Sahara. The rainy season in the area extends from July to September. Being a typical semi-desert zone sometimes the rains are received during just one month instead of a more even distribution over three months. Once every five years the annual rainfall drops below the average and during the other four years the distribution patterns can deviate, and long periods of drought are experienced.

According to the findings of the Agricultural Scientists working in the area, the establishment of the two staple food crops in the area, sorghum and millet, requires even distribution of rainfall. The ideal situation is to receive 20 – 25 mm every third or fourth day during the three months after sowing of the two crops.

Ed-Daw observed that sorghum and millet fail to produce grains when a drought spell is experienced half way after the sowing date which is before they reach a maturity in 90 – 120 days. But again

he observed that during normal rainfall years some of the plants bear combs earlier than others. He started collecting seeds from the combs which appeared first and saved them to grow during the subsequent season while he consumes or sells the other produce from the rest of the field.

Having only few seeds, of the early maturing lines, from both sorghum and millet during the first year, he mixed the seeds of each crop with the seeds of sesame, an important cash crop grown in the area, and sowed them together. That is to say the sesame and sorghum are grown in a separate field from the sesame and millet. Again he picked up the combs which appeared first from the sorghum and millet and kept them for the same purpose. He repeated this action for a number of years until he managed to obtain two crops which reached maturity in a period of just 50 days for sorghum and 70 days for millet. The normal maturity period for sorghum and millet is 90 and 120 days respectively. Other farmers from the village have now started to adopt these ideas of Ed-Daw's which he has been using successfully for the last few years.

The case has been reported to the Agricultural Scientists of the Agricultural Research and Technology Corporation to validate the findings and whether it is true that the two crops mature at that time reported by the farmer. This validation process will be implemented on the fields of farmers who adopt the innovative practice. Farmers will be part of the validation and will participate in the input and output of the process.

Innovation 8: Water Purification Techniques using naturally available Coagulants



Area Bronga dam - N. Darfur – Sudan.



Ownership: Practical Action - Sudan

Author: Mohamed Majzoub

Background:

Potable hygienic water is a pre-requisite for health and efficient use of water. Water borne diseases are common among rural and poor communities, particularly those who use surface water from the rivers, seasonal streams and water reservoirs. The problem becomes more serious during the rainy season when water turbidity is at its maximum. Provision of sanitary water to these communities at home is beyond the reach of government and communities because of budgetary, technological, population density and poverty reasons. At this point, traditional techniques are indispensable to gain access to less risky potable water. Moreover, these traditional techniques proved to be more promising with minimal modifications required before they could be used in a wider context.

Natural Water Coagulants need in Sudan:

Rural people used the following materials as water coagulants:

1) Rawag (Local Alum)

This is a clay soil selected from river shores or dried stream and pond beds. The clay is collected, packed and sold in the market for the purpose of purifying water.

2) Kurdala roots (Maerua pseudopetalosa)

This is a small seasonal shrub. It grows in the rainy season. It can be found in many localities in the savannah zone. The fruit is used by some communities in porridge making or cooked with lamb meat. The roots are used in water coagulation with an extra advantage of adding flavour.

3) Seeds of Moringa oliefera (Rawag free)

The tree originated in India and the gulf, it is relatively small growing up to 7m high and it is planted in many parts of Sudan. It flowers during November, December and January and produces mature fruits during January, February and March. The seeds contain edible oil and lubricant (38%). The powdered seeds are used as coagulants and the leaves, young pods and flowers are used as food and fodder.

4) Some communities used the seeds of Acacia nilotica ('Sunut') and Azadirachta indica (Neem) seeds for assessment

The reporter of this innovation tested the efficiency of coagulation and safety of use and came up with the following findings:

- a) The initial turbidity reduction caused by Rawag and Kurdala is higher than that of Alum.
- b) All the coagulants tested reduced the turbidity of the raw water irrespective of the initial turbidity.
- c) These coagulants vary in their ability to remove colloidal suspension from high turbidity raw waters. 'Kurdala', 'Rawag' (clay soil) and Moringa seeds are highly recommended while 'Sunut' and 'Neem' seeds are not encouraged for water purification (potentially toxic).
- d) Some guiding principles need to be extended to users regarding the dose and efficiency.
- e) The limitation of using these natural coagulants for large scale operations needs to be addressed.

Innovation 9: Sudanese homemade cosmetics:



Dilka, Karkar and Khomra

Location: Northern Sudan

Ownership: Community.

Reporter: Siham M. Osman

Background:

Sudanese women have unique local perfumes and cosmetic rituals used on the occasions of religious and private feast especially wedding. Such as; Khumra, dilka, Karkar, Dukhan, and henna decoration. These cosmetics are opened only to those who are married or about to get married.

Through its history, the Sudan has been greatly influenced by many cultures namely the pharaonic, Christian and Islamic cultures. The country has experienced waves of immigration from the Arab Island

and neighboring parts of Africa and beyond. All these cultural and religious influences have melded together along with the local indigenous cultures to create a *mélange* of unique Sudanese traditional beliefs and rituals. This unique history and vast variety of cultures make the task of determining these rituals exact origin a complex one.

Dilka "durra dough"

Cosmetic and health restorative dough, mainly applied in massage. Its main ingredient is: de hulled durra flour, '*mahleb*', cloves and powdered sandal wood.

'*Mahleb*' (black cherry seeds) and cloves soaked in water and let steep for several hours and then strain through a fine strainer, the seeds discarded and the watery extract gradually added to the dura flour and kneaded by hand into soft dough. The dough placed in a wooden dish and enriched with fumes and vapour of burnt '*talih*' wood and '*shaff*' wood (The wood is placed inside a pit and the smoke aromatizes the dough). The dish is covered with '*shamla*' (woolen blanket). At a regular interval a handful of paste made of fine ground '*mahleb*', *cloves* and sandal wood is added to the dough until the material is cooked. Then collected as small balls and preserved in '*huqs*' (wooden pots) until needed

'Dilka' is used by women to clean the body by rubbing their skin with it so that the skin is exfoliated and become soft.

'Khumra' (Sudanese fragrance)

Ingredients: '*mahlab*', cloves, powder sandal wood, musk, *dufr* "fingernails of sea creatures", and special types of liquid perfumes.

After adding many perfumes to the powdered ingredients ('*mahleb*', *cloves*, '*sanda'l*' wood and musk) a paste is produced. This paste is smoked in a charcoal fire with pieces of sandal wood then mixed with gum *Olibanum*. The complete preparation process for this fragrance takes over ten hours.

'Karkar' (scent oil)

Scented oil made from Sesame oil, '*wadak*' (animal fat) or wax, clove essences, '*mahleb*', sandal wood, orange peel, and a variety of liquid perfumes. Used as cream for hair and cosmetic skin management.

'Dukhan' (scented smoke bath)

The wood used is 'Shaff', and 'talih'. Wood is placed inside a hole. A *birish* rug, woven from palm tree branches, is then placed on the pit. The body is then thoroughly rubbed with '*karkar*'. The woman sits on the top of the pit, covered her with '*shamla*', allowing the rising smoke to fumigate her body and give the skin a yellow colour. Other than this it gives a nice aroma in the atmosphere it burns in and has therapeutic value for example alleviation of joint pain and treatment for children with diarrhea and vomiting, where the mother uses 'Dukhand' before give her child the breast to feed on.

These cosmetics and perfumes have played an important role in generating income for women. As women in both rural and urban areas in Sudan are increasingly forced to shoulder additional burdens as a result of the economic hardship and the massive migration of men from rural areas to cities or out of the country due to man made as well as natural disaster. It has been reported that a number of IDPs women are engaged in making and selling these products. More over These products even find a market abroad in some Arab countries.

Chapter (6)

The Way Forward: A Framework for an Action Plan for Local Innovations in Sudan

The Opportunities:

Sudan has the opportunity to make use of its wealth and diversity of local innovations and the potential to disseminate them to other countries. Another opportunity remains in improving its local innovation programme to protect human, plant, animal health and the environment. This will lead to the opportunity for economic development, reduction of poverty and enhancement of trade. A local innovation action plan should be developed and proposed in close consultation with members of the community and committed partners. This action plan should lay out the basic framework for further discussions. The plan should consider capacity building, areas for technical assistance, priorities and responsibilities for implementation, monitoring and evaluation. The action plan represents a road map and a guideline for further work to capture more innovations, improve the existing ones and exchange these innovations with others through active participation with similar organizations.

The Goals:

It is reasonable to assume multiple goals in the action plan for local innovations. The goal of capturing, analysing and documenting local innovations remains the most important. It is also immensely important that the product is safe in order to ensure human, animal and plant health for local consumption and for export. The success of the innovation depends to a large extent on its demand,

affordability and durability. Therefore domestic and foreign trade facilitation and promotion is a necessary pre-requisite for a successful local innovation. At this level conducive policy framework need to be established and put to work. This policy framework can materialize only when it is supported by institutions starting from the grassroots and ending at the decision makers with a forward and backward flow of information and decisions. Other goals have specific issues to be addressed at local, regional and national levels.

Objectives:

There are four major objectives identified for the action plan that support the above goals:

- Establishment and implementation of local innovation standards, institutions, laws regulations and certification bodies.
- Management and encouragement of local innovation and extension of local innovation concepts to formal, informal education, research and extension.
- Improvement of competitiveness between innovative products through advertising and exhibitions
- Policy making in compliance with rules and provisions to be set by the leading organizations working with indigenous people and their practices.

Local Innovations Programmes and Activities:

- Building awareness of the stakeholders, researchers and policy makers.
- Increase the capacity of the public and private sectors.

- Application of innovation good practice systems developed by local innovation organizations.
- Application of innovation research cost recovery system.
- Risk assessment of local innovations.
- Establishment of source verification systems.
- Promote and increase market access to local innovations.
- Increase and improve profitability for local innovators.
- Introduce cost-saving technologies.

Documentation as a Tool for Change using Research and Extension Services:

- Building documentation and communication capacities.
- Documentation of local plants and animals genetic resources.
- Documentation of the social and cultural impacts of innovations.
- Documentation of the ecological and production context of innovations (ecological impact).
- Documentation of the livelihood and economic significance (economic impact).
- Documentation of chances for sustainable use and conservation (resources for the future).
- Development of safeguards against piracy, counterfeiting and dumping (laws and regulations).

Relevance of Local Innovations to the Poor

While most of local innovations were made by poor communities, the following sectors are of particular interest to the poor:

- Agriculture and agricultural machinery.
- Animal husbandry and ethnic veterinary medicine.
- Use and management of natural resources.
- Primary health care, preventive medicine and social health care.

- Combating HIV/AIDs, malaria and contagious disease of children and women under stress.
- Mitigating climate change effects on natural resources and human health.
- Saving and lending.
- Community development.
- Poverty alleviation.

It is important to note, that not all indigenous practices are beneficial and not all provide the right solution for a given problem¹.

¹ World Bank (1998). Indigenous knowledge for development – Knowledge and Learning Centre. Africa Region.

Chapter (7)

Conclusion and Recommendations

(A) Rights of the local innovators

Indigenous people retain and affirm all of their inherent collective rights as sovereign communities. These rights include the right to protect their own survival by protecting their cultures, languages, knowledge and innovation systems from expropriation, encroachment or piracy. Such right violations – in today's world became clear in business and trade. Multinational companies, in competing with each other and using their powerful intelligence machines and financial capacities, eroded the rights of local innovations and deprived them the rights to own their genetic resources.

Indigenous knowledge, innovations and laws are indispensable to their identity and are a foundation for self-determination. We need to work collectively to support communities to maintain and protect their culture and identity through the development of a regulatory mechanism to make use of their innovations in full agreement and consent.

The use of indigenous peoples knowledge and resources is unlawful and illegitimate unless it is done in conformity with their laws. These laws must be disclosed to the public through a notification and publication system. This system need to be developed and communities should be trained in tracing their innovations and practices.

The regulations, laws and procedures must be made by the local peoples concerned with professional guidance and transparency in all aspects of their properties. Many examples from developed and

developing countries may be used to design a model regulation that best suit the interest of indigenous people.

(B) Collective and participatory actions

Ensure that local people, in particular their children learn the local laws concerning the acquisition and use of knowledge, innovations and resources. A well designed and articulated system of basic education should be emphasized and implemented as a major subject for children to build up a generation capable of preserving his parents innovation and developing his own.

Prevent and condemn all trade in unlawfully obtained resources or knowledge and act together to deprive corporations of any profits from such trade through lawful procedures. There is an increasing demand to disclose and put on air all the wrong doings made by pirates of community properties and assets. In this respect all ports and points of transpoundry trade must be under clever and strict securitization to make sure that the community resources are moving legally. Civil society organizations should be trained in advocacy and lobbying to support this type of work.

Take steps to prevent any assertion of intellectual property rights to the genetic integrity or genetic potential of biotic systems in ancestral territories and take strongest hand against protecting life forms, processes or modifications particularly on using community resources in pharmaceutical for the treatment of endemic and pandemic killer diseases.

Develop pilot instruments for the capture, dissemination and application of local innovations and facilitate the sharing of local innovations and practices through exchange.

There is a real need to promote and integrate innovations and practices in the development plans and processes and to building capacities in all aspects of local innovations.

Address the impacts of local innovations on livelihood, poverty reduction and community welfare.

Indigenous knowledge, local innovations and practices do matter to communities and are making a difference at local family levels and humanity at large. Exploiting these assets commercially led to depriving the poor from gaining accesses to the benefits obtained from them. People and governments who are supporting the poor are now fully aware of the risks and danger of marginalizing the fragile poor communities through the use of their own resources. Many international conventions, agreements and protocols dealing with these issues are on the shelf for everybody use. There is an urgent need to sensitize the governments, the policy makers, the scientists and the community leaders and active members to work together to respect and protect the community rights and farmers rights and at the same time to avail their products for all the needy and the poor in a fair and just manner.

(C) Institutional and organizational settings

1-Establishment of a national regulatory body to shoulder the responsibilities of indorsing policies, structuring of laws and monitoring the inflow and outflow of local innovations.

2-Designing an aggressive and effective teaching and learning programme at all educational levels with emphasis on pre-school education.

3-Activating a national forum and think-tank to address the different issues of local knowledge and innovations.



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