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Traditional Knowledge: A Potent Weapon to Achieve Food Security in the Era of Climate Change

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Abstract

Indigenous people have millennia of experience in collecting and applying local environmental information to help their communities plan for and better manage the risks and impacts of the natural variability and extremes of climate. Here comes traditional knowledge's role to help reduce the risks related to food security. In this paper the researcher is trying to establish that where traditional knowledge is revived, there the food security outcomes are better. Millions of traditional farmers and indigenous and local communities use their traditional knowledge to ensure food and livelihood security in a wide range of ecosystems, including fragile and harsh ones. Such practices can also be applied in innovative ways to help tackle today's problems through their on-farm/in situ conservation. These vulnerable groups use their traditional knowledge about the environment, e.g., frequency of rains, flowering of certain plants, frequency of pest influxes, etc. to determine when to plant and when to harvest. Indigenous peoples rely on a diversity of crops, varieties and planting locations to cope with excessive or low rainfall, drought and other environmental changes. This serves as a safety measure which ensures that, in the face of severe environmental change, some crops survive. Various adaptive strategies employed in areas that are subject to water stress build upon traditional indigenous peoples' techniques of soil and water conservation. Indigenous peoples around the world diversify their livelihood systems in order to cope with climate and environmental changes. Strategies such as maintaining genetic and species diversity in fields and herds provide a response to uncertain weather conditions, while the diversified use of the landscape, mobility and access to multiple resources increase the capacity to respond to environmental variability and change. Hence in the present paper deals with issues related to recognition of indigenous peoples' coping and adaptation strategies, and respect for their systems. Further there should be dialogue with governments and the private sector to value the indigenous peoples' knowledge and perceptions regarding food, livelihood systems, natural resources management and biodiversity conservation. And the key elements that must be incorporated into climate change policy at the national and international levels. In order to do so, indigenous people should be enabled to actively participate in decision-making processes at regional, national and local levels and same can be achieved by giving affirmative rights to these communities by way of international treaty and national legislations.

Keywords: *Traditional Knowledge, Climate Change, Food Security, indigenous community, IPR policy, vulnerable groups*

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INTRODUCTION

"Civilization as it is known today could not have evolved, nor can it survive, Without an adequate food supply."

Norman Borlaug

The biggest challenge before us is to produce enough for the continuously growing population. That too in the era of realization that though we were provided plenty by the nature we have not used it wisely and now faced with the greatest challenges of our times i.e., food security along with the climate change. The threat of food security faced by today's generation is not because of climate change scenario but also because of unsustainable practices used by us to exploit Mother Nature. Hence in this situation the best answer to resolve the mounting problem is to recognize the potential of traditional knowledge and its ways and sustainable practices.

It is important to understand that climate change affects the poorest and the marginalized the most, that too, disproportionately. The reason behind is their survival and livelihood depend entirely on nature. Hence the other side of the coin is that to survive, they have to be on vigil therefore, having their own coping strategy to deal with the problems created by the climate change. Thought generally they are depicted as victims of climate change but are sensitive to environment they live in and have adaptive capacity and resilience and have capacity to modify their behaviour and agricultural with innovative survival techniques and response to changing climate. In this background it is important to understand that traditional knowledge holders can provide important inputs to modern governments and international organizations in the area, if, observations, adaptations and coping techniques to deal with climate change effects and biggest among them is the agriculture or food security.

The most amazing thing about traditional knowledge is that it is time tested and passed on from generations to generations hence can be made a main stream solution for the climate change which is affecting our lives in a big way. Their system is very dynamic as it evolves, adjusts and modifies while responding to climate change. These communities develop the coping strategies keeping in mind their own observations and indigenous data bank how to cope with unusual climate conditions and accompanying impacts. One of the most repulsive effects of climate change is threatened food security system due to unpredictable weather conditions which are faced by world due to all protruding climate change.

INTERNATIONAL RESPONSE TO THE ESCALATING FOOD CRISIS

Humans have a "biological demand" for food—we all need food, just as we need water and air, to continue to live [1]. It is a systematic fact of capitalist society that many are excluded from fully meeting this biological need [2]. If we check the international scenario than we will see that time and again directly or indirectly right to food has been discussed. As per Article 25 of the Universal Declaration of Human Rights of 1948, everyone has 'The Right to Adequate Food". Further Article 11 of International Covenant on economic, social and cultural Rights also talk about the right to adequate food. The right to food is explicitly finds mention and recognition in the international covenants on Economic, social and cultural rights of 1996. It states that 'The state parties to the covenant recognize the right of everyone to an adequate standard of living for himself and his family, including adequate food, clothing and housing…' [3]. 'The fundamental right of everyone be free from hunger' is also emphasized in the same covenant.

Further UN Committee for economic, social and cultural rights in 1999 state that "the right to adequate food is realized when every man, women and child, alone or in community with others, has physical and economic access at all times to adequate food or means for its procurement" [4].

The Food Crisis was finally put high on the international agenda in 2007/2008. UN Secretary-General Ban KiMoon himself established and chaired the so-called High-Level Task Force (HLTF) on the Global Food Crisis in April 2008, bringing together the UN system with its specialized agencies, funds and programmes and the Bretton-Woods Institutions, in order to develop a common strategy to combat the crisis and to coordinate this strategy's implementation [5].

As per recent estimates of Food and Agricultural Organization of United Nations, by 2050 world's population will reach 9.1 billion. Water is a key to food security. Crops and livestock need water to grow. Agriculture requires large quantities of water for irrigation and of good quality for various production processes. While feeding the world and producing a diverse range of non-food crops such as cotton, rubber and industrial oils in an increasingly productive way, agriculture also confirmed its position as the biggest user of water on the globe. Irrigation now claims close to 70 percent of all freshwater appropriated for human use [6].

In 1948, the Universal Declaration of Human Rights affirmed the right of everyone to adequate food. However, access to adequate

food in the rural areas of many developing countries depends heavily on access to natural resources, including water, that are necessary to produce food. The UN General Assembly declared access to clean drinking water and sanitation as a human right on 28 July 2010. But the right to water in the context of the right to food is a complex question.

The Organization for Economic Co-operation and Development (OECD) –Food and Agricultural Organization (FAO) Agricultural Outlook 2012–2021 suggests that structurally higher food prices are here for the coming decade. Strong demand and prices will provide farmers with the incentives needed to feed a world population that is expected to exceed 9 billion by 2050 [7].

In response to food crisis, World Bank called upon governments to embark upon New Deal for Global Food Policy, which is adopted by International Monetary Fund and more than 150 member countries. Further World Bank also established the Global Food Crisis Programme in 2008, to grant immediate relief to those countries that were hit particularly hard by high food prices and to assist countries to bear the burden of higher production and marketing costs.

When we discuss about all these programs then the priority for them has remained largely the distribution of seeds and fertilizers in all programmes. The UN agencies IFAD International Fund for Agricultural development (IFAD), FAO and WFP supported his appeal, recognizing the food crisis as a human rights issue and acknowledging the need to increase transparency, accountability, the Rule of Law and to promote participation.

TRADITIONAL KNOWLEDGE AND CLIMATE CHANGE

As indigenous communities live and survive in the ecosystem, it gave them the exposure and chance to have first hand exposure to observe and notice the climate change and live its implications. This forced them to develop resilience against climate change. Along with many other things these communities notice the disappearance of certain crops and then even noticed the appearance of new species. The climate change has varied changes for example somewhere there was excessive spells of heat waves, other places faced droughts, periods of chills or melting of ice in colder regions etc. These directly affected the food they were consuming for ages. As in the changed climate conditions certain crops stopped growing hence they started experimenting for their survival and came up with new growing techniques. Various adaptive strategies were innovated by these communities and were employed in the form of water and soil conservation.

Indigenous communities have vast knowledge bank ranging from temperature and rainfall to the frequency of extreme climate conditions [8]. The intimate knowledge of plant and animal cycles gives them ability to link the natural events with particular climate conditions thus predicting the seasonal events. They have observation about every event i.e., winds, rainfalls. These communities have a stupendous mechanism relating to disaster preparedness.

A limited amount of land is suitable for growing crops. Every year farming land is lost to desertification, and climate change is a serious threat to future agricultural production. Indigenous Communities apply traditional ecological knowledge primarily as warning systems. Their generations have preserved the knowledge from generations for calculating risks related to weather conditions that affects the agriculture directly. They have developed knowledge system that which can calculate the risks related to droughts, floods etc. Traditional knowledge is used to observe, monitor and report weather related impacts on food and agricultural systems and how to adjust to these climate related impacts.

Hence, these above mentioned details make it clear that the traditional knowledge is self-sustained system, which needs to be protected. If these indigenous communities are not supported to protect their traditional knowledge than the world will lose the time-tested mechanism to predict the climatic changes and developed system of resilience and subsistence. If their knowledge base is not protected than in that situation the world will

have to spend lot of money in Research and Development to understand the climate change patterns and then develop the strategy to deal with it in terms with food security. Which will take lot of time and money and mean while affect the huge population of the world. If we take necessary steps at world forums to protect the traditional knowledge base, then we will face major food crisis.

Another necessary step in protecting this knowledge base is collaborative efforts by these communities, government and non-governmental organizations.

TRADITIONAL KNOWLEDGE AND FOOD SECURITY

The food system of indigenous communities is adversely affected by the climate change. As their survival in every sense of the world depends on the ecosystem they live. All over the world where ever these indigenous communities exist they hold traditional knowledge, skills and expertise and practices related to food and agricultural production and diversity. For them *in-situ* and *ex-situ* conservation of genetic resources for food and agriculture is relevant and they survived on this for centuries.

FAO has from its inception in 1945 has acknowledged and used traditional knowledge to tackle the growing problem of soaring food crisis and climate change. Traditional farming and forestry and long-established practices ensure food and agricultural diversity [9]. It has been noticed by various research organisations world over that traditional communities use their traditional ecological knowledge to ensure that food security in wide range of surroundings or ecosystems no matter in what geographical conditions they are living.

The application of such indigenous knowledge in the area of ecosystem and landscape management, water management, soil conservation, biological control of pests and diseases, ecological livestock practices and agricultural practices and plant and animal breeding often enhances food security and prevents or alleviates poverty [10].

Traditional knowledge is used to observe, monitor and report weather-related changes in food and agricultural system and adjust to these climate related impacts. Hence if this knowledge is not preserved then there will be loss of such knowledge and resilience results in increased food insecurity, poverty and conflicts, while livelihood declines and biodiversity disappear.

Indigenous peoples' traditional knowledge offers information and insight that complement conventional science and environmental observations, as well as provide a holistic understanding of the environment, natural resources and culture, and the human interrelation with them.

Indigenous communities have generations of knowledge and understanding in obtaining and applying local environmental information. This information and knowledge is stored to facilitate and help their communities/clan to chart out for better management of the risks and impacts of the nature's unpredictability and inconsistency which is due to climate change. Indigenous peoples' traditional knowledge offers information and insight that complement conventional science and environmental observations, as well as provide a holistic understanding of the environment, natural resources and culture, and the human interrelation with them [11].

These traditional communities rely heavily on a multiplicity of crops, varieties and planting locations to cope with excessive or low rainfall, drought and other environmental changes [12]. This rotation and changes of crops and geographical locations provide a fortification which makes sure that, in the face of harsh environmental transformation some crops subsist, if not all varieties. Various planning and strategies regarding conservation of water and soil in the present times, for the areas which are subjected to water stress and agricultural difficulties, can utilize traditional indigenous peoples' techniques of soil and water conservation.

TRADITIONAL KNOWLEDGE FOOD SECURITY AND CLIMATE CHANGE

Extreme weather conditions are becoming increasingly frequent and intense therefore, it is the need of the time that the indigenous people's knowledge base be utilized to manage and reduce the risks and to improve preparedness for tomorrow's unforeseen disasters related to climate change. This will also protect the civilization from the emergencies affecting food and agriculture. This can be done by mixing the cutting edge and technology with the traditional knowledge; it will lead to innovative collaboration.

To adapt to climate change conditions that affect the food security these indigenous communities select and improve the traditional seeds and crops along with this they also try to introduce and select new seeds, crop varieties and domesticated variety of animals.

There is a strong correlation between the area which is inhabited by the indigenous communities and the area with the biodiversity concentration and natural resources. They have unique contribution to the mitigation and adaptation strategies at biodiversity conservation and food security.

TRADITIONAL KNOWLEDGE CATEGORIZATION RELEVANT FROM FOOD SECURITY POINT OF VIEW

Traditional knowledge refers to institutionalized local knowledge, the know-how accumulated across generations, guiding human societies in their interactions with their environment. It is the basis for local-level decision-making in many rural communities and ensures the well-being of people through its multipurpose functions, including food security. However, indigenous knowledge is rarely considered in the design of modern climate change adaptation and mitigation strategies. Adaptation is about changing policies, behaviour or infrastructures, and thus, depends on cultural factors, institutions or social networks. Incorporating this knowledge system can be of great interest to develop such strategies in conjunction with local people [13].

There is growing evidence of the role of traditional knowledge in responding to climate change. Even the International Panel for Climate Change in its 4th Assessment highlighted the role of indigenous knowledge and crop varieties in mitigating and adaptation to climate change. Traditional farmers have conserved, observed and improved thousands of crops, species and varieties using traditional knowledge which is passed to them through generations.

Traditional knowledge is huge body of knowledge and the literature available on traditional agricultural knowledge can be divided into five categories of knowledge which is related to agriculture. These categories can be utilized in the wake of climate change to have sustainable survival. These categories are given below:
Firstly, knowledge about the resilient variety or properties: Many traditional communities live and survive on the marginal land i.e., not very fertile land, where climate change impacts are greatest clubbed with the already existing hardships created by nature. Hence, they have no other option than to recognize the naturally existing drought and pest resistant crops and preserve them and knowledge about them.

Secondly, due to these hard-surviving conditions they are forced to develop the knowledge about the plant breeding. They experiment on farms actively. They do it by selecting seeds for generations and then try their hand on cross breeding to create no varieties more suited to the present changing weather conditions.

Thirdly, knowledge about the crop relatives: wide areas around their farm provide for the wider gene pools for crops improvement and domestication and these communities use wild foods to supplement their diet [14]. This is utilized when due to climatic change conditions when crops fail.

Fourthly, resilience farming and resource management is another commonly used strategy by these traditional communities. Traditional agricultural practices conserve key resources of agriculture like soil, biodiversity, water etc.

Lastly, the most important strategy about climate forecasting: These communities have developed the skill to forecast local weather, predict extreme events and provide accessible information to farmers, at a scale, which can be more useful at local levels.

DIFFERENT APPROACHES TO TRADITIONAL KNOWLEDGE PROTECTION

After discussing the relevant branch of traditional knowledge which can be utilized for the sustainable food security mechanism, it's now necessary to consider the recognition issues of traditional knowledge. At international level initiatives and proposals for traditional knowledge protection from governments, NGOs and indigenous groups, reflect a diversity of approaches and perspectives.

They range from a narrow interpretation focused on compensation through voluntary contracts (as advocated by some northern countries), to legal requirements for the fair and equitable sharing of benefits (as advocated by many southern countries), to a more comprehensive approach based on recognition of land/human rights, indigenous decision-making and the *in-situ* maintenance of knowledge systems (as advocated by many indigenous groups) [15].

There is need to investigate the needs of these communities and then develop any policy guidelines or international treaty which can fully and effectively protect the rights of indigenous communities.

First and foremost, the existing of their customary laws need to be recognised for sharing, acquiring and utilizing the traditional knowledge. Secondly, understanding the system of knowledge ownership and transmission, thirdly, recognize the power of community members to decide the commercial users and terms.

CHALLENGES IN RECOGNISING TRADITIONAL KNOWLEDGE

In view of above it is necessary to add here that till date there is no international treaty which details the traditional knowledge protection. The reason is that it is difficult to have consensus on protection mechanism for traditional knowledge. As the challenge are manifold to give it recognition. To begin with there is no consensus when it comes to defining traditional. Further it is important to define that who will hold the traditional knowledge rights when they will be defined as legal rights. Further what to protect and what not to protect. As there is some part of traditional knowledge which is written or kept in some tangible form, then there is some portion of knowledge which is passed through generations through word of mouth, further there is some portion of knowledge which is already in public domain and part of day to day life of people who are in mainstream.

Hence first and foremost there is a need to develop consensus on the definition of traditional knowledge thereafter consensus as to who will be holding these community rights. Regarding vesting of legal rights, it's difficult to define clearly who will be owing these rights. Different communities in different geographies have different internal working system which decides the dominant positions within their communities.

Further another very important aspect with regard to recognising traditional knowledge is the tenure of monopoly. At present efforts are being made under the umbrella of WIPO. It has established the Inter-Governmental Council of Traditional Knowledge, folk lore and genetic resources (IGC). Now it is relevant to understand that the aim of establishing WIPO was to promote the intellectual property rights. Hence any treaty which is drafted by IGC will have dominant Intellectual Property Rights (IPR) regime mind set. But traditional knowledge cannot be equated with other set of IPR's.

Traditional knowledge need to be looked at as protecting the cultural rights of indigenous communities. And it's not about only earning profit out of their generations old lineage. Thus, there is need to look at traditional knowledge from different perspective and protect it within altogether different legal scenario as suited to it.

To summarise, some of the key challenges surrounding the protection of traditional

knowledge on the basis of customary law are the following [16]:

1. Recognising the authority of customary law for traditional knowledge protection issues, both within and outside indigenous peoples' territories, and at international level;
2. Ensuring that customary law and rights are recognised in practice by formal legal systems and cannot be extinguished or overruled, even when there is a conflict between them, whether customary law is written down or not;
3. Enabling indigenous institutions to develop, apply and interpret customary law through their own customary institutions and law systems;
4. Allowing flexibility to recognise diverse customary legal systems;
5. Understanding key underlying principles and processes of customary law systems which need to be recognised and strengthened in formal law;
6. Understanding the factors which influence the choice of customary and national law by communities for TK and biological resources.

DIFFERENT APPROACHES TO DEAL WITH FOOD CRISIS

Ecosystem approaches to agricultural intensification have emerged over the past two decades as farmers began to adopt sustainable practices, such as integrated pest management and conservation agriculture, often building on traditional techniques [17]. Sustainable crop production intensification is characterized by a more systemic approach to managing natural resources and is founded on a set of science-based environmental, institutional and social principles borrowing from traditional practices.

Environmental Principles

The ecosystem approach needs to be applied throughout the food chain in order to increase efficiencies and strengthen the global food system. At the scale of cropping systems, management should be based on biological processes and integration of a range of plant species, as well as the judicious use of external inputs such as fertilizers and pesticides. Sustainable crop production intensification (SCPI) is based on agricultural production systems and management practices that are described in the following chapters. They include:

- maintaining healthy soil to enhance crop nutrition;
- cultivating a wider range of species and varieties in associations, rotations and sequences;
- using well adapted, high-yielding varieties and good quality seeds;
- integrated management of insect pests, diseases and weeds;
- efficient water management.

For optimal impact on productivity and sustainability, SCPI will need to be applicable to a wide variety of farming systems, and adaptable to specific agro-ecological and socio-economic contexts. It is recognized that appropriate management practices are critical to realizing the benefits of ecosystem services while reducing disservices from agricultural activities [18].

Institutional Principles

It is unrealistic to hope that farmers will adopt sustainable practices only because they are more environmentally friendly. Translating the environmental principles into large-scale, coordinated programmes of action will require institutional support at both national and local levels. For governments, the challenge is to improve coordination and communication across all subsectors of agriculture, from production to processing and marketing. Mechanisms must be developed to strengthen institutional linkages in order to improve the formulation of policies and strategies for SCPI, and to sustain the scaling up of pilot studies, farmers' experiences, and local and traditional knowledge.

At the local level, farmer organizations have an important role to play in facilitating access to resources – especially land, water, credit and knowledge – and ensuring that the voice of farmers is heard [19]. Smallholder farmers also need access to efficient and equitable markets, and incentives that encourage them to manage other ecosystem services besides food production. Farmer uptake of SCPI will depend on concrete benefits, such as increased income

and reduced labour requirements. If the economic system reflects costs appropriately – including the high environmental cost of unsustainable practices – the equation will shift in favour of the adoption of SCPI.

Social Principles

Sustainable intensification has been described as a process of "social learning", since the knowledge required is generally greater than that used in most conventional farming approaches [13]. SCPI will require, therefore, significant strengthening of extension services, from both traditional and non-traditional sources, to support its adoption by farmers. One of the most successful approaches for training farmers to incorporate sustainable natural resource management practices into their farming systems is the extension methodology known as farmer field schools [20]. Pioneered in Southeast Asia in the late 1980s as part of an FAO regional programme on integrated pest management for rice, the FFS approach has been adopted in more than 75 countries and now covers a wide and growing range of crops and crop production issues.

Mobilizing social capital for SCPI will require people's participation in local decision-making, ensuring decent and fair working conditions in agriculture, and – above all – the recognition of the critical role of women in agriculture. Studies in Sub-Saharan Africa overwhelmingly support the conclusion that differences in farm yields between men and women are caused primarily by differences in access to resources and extension services. Closing the gender gap in agriculture can improve productivity, with important additional benefits, such as raising the incomes of female farmers and increasing the availability of food [21].

With policy support and adequate funding, sustainable crop production intensification could be implemented over large production areas, in a relatively short period of time. The challenge facing policymakers is to find effective ways of scaling up sustainable intensification so that eventually hundreds of millions of people can benefit [22]. In practical terms, the key implementation stages include:

- Assessing potential negative impacts on the agro-ecosystem of current agricultural practices. This might involve quantitative assessment for specific indicators and reviewing plans with stakeholders at the district or provincial levels.
- Deciding at national level which production systems are potentially unsustainable and therefore, require priority attention, and which areas of ecosystem sustainability (e.g., soil health, water quality, conservation of biodiversity) are priorities for intervention.
- Working with farmers to validate and adapt technologies that address those priorities in an integrated way and use the experience to prepare plans for investment and to develop appropriate institutions and policies.
- Rolling out programmes (with technical assistance and enabling policies) based on the approaches and technologies described in this book.
- Monitoring, evaluating and reviewing progress, and making on course adjustments where required.

This process can be iterative, and in any case relies on managing the interplay between national policy and institutions, on the one hand, and the local experience of farmers and consumers on the other. Monitoring of key ecosystem variables can help adjust and fine-tune SCPI initiatives.

CONCLUSION

There is growing recognition that traditional knowledge and customary sustainable use of land and biodiversity for the purposes of food security by local communities'. This includes resilience to climate change, as well as biological and cultural diversity, and global sustainable development. Climate change is a negative response currently experienced in the world because of the growth of greenhouse gas emissions due to the burning of fossil fuels, mainly for industrial activities and motor transportation.

Sustainable livelihoods, cultural heritage and the knowledge of indigenous peoples can be threatened by action to combat biodiversity loss and climate change. On the other hand, when respectful relationships are built with indigenous peoples and their sustainable management of resources, it can help enhance

national and global action on climate change. Furthermore, it can also considerably contribute to conservation, sustainable use and the equitable sharing of benefits arising from biodiversity.

The increased awareness of the links between traditional, indigenous and local knowledge and sustainable development is reflected in evolving international discussions on policies related to the environmental challenges and genetic resources – including in the scientific assessments that seek to inform these policies. Understandings from these distinct forums, including best practices on ensuring participation and engagement of indigenous knowledge-holders, is being considered. Thus, traditional knowledge is a potent weapon to fight food crisis.

It is need of the time that governments should try to build the capacity of the indigenous communities and integrate their knowledge relating to coping strategies specially related to food security with modern coping strategies. This will help resolve the problem of food security with the creation of unique strategy which could be mix of traditional and modern coping methods.

Since 2009, World Intellectual Property Organization (WIPO) members have embarked on formal negotiations towards one or more international legal instruments that would ensure the effective protection of genetic resources, traditional knowledge and traditional cultural expressions.

"Climate change is intrinsically linked to public health, food and water security, migration, peace, and security. It is a moral issue. It is an issue of social justice, human rights and fundamental ethics.

Ban Ki-moon
Former Secretary-General of United Nations

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