Sustainable agriculture and sustainable development among tribes in agency area of Visakhapatnam district

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Abstract

Traditional agriculture was an important practice in the agency areas, especially among tribal communities, both from socioeconomic and ecological points of view. The local knowledge in traditional agriculture among these groups is a significant feature in the villages. Mixed cropping, crop rotation, and mulching were some of the scientific practices in traditional agriculture. However, agriculture was more or less of subsistence over the years; this practice is being sidelined by modern technology in agricultural practice. No doubt farmers are rational in selection of crops or technologies, but their rationalities are influenced by the available local resources around them and the service provisions by public and private agencies for agricultural development. In this context the present study on 'Sustainable agriculture and sustainable development among tribes in agency area of Visakhapatnam district', is a significant to find out the present situation in agriculture with reference to development of tribal communities in agency area of Visakhapatnam. Thus, the study observed that many farmers have been selective and rational in selection of technology and crops. At present vegetable cultivation is an alternative source to get income support among the tribal farmers. Some medium and large farmers have been successful in cultivation of oil seeds with modern practices. But the marginal and poor farmers have not been benefited out of this. The involvement of public and private agencies is not so effective in development of agriculture. Therefore, the agency people less eager to understand the needs of the communities in this region due to no equity in distribution of services both communities and villages wise.

Keywords: Sustainability, agriculture, development, tribal communities.

Introduction

Agriculture is the most primitive occupation of the tribal people in India. Though the people had changed their cultivation pattern from traveler's cultivation to settled cultivation (Teegalapalli, K., et al. 2016)[1], but some of the practices have remained unchanged among many group of farmers. The unchanged practices may be due to fact that they find the practices more sustainable. but some of the practices have remained unchanged among many group of farmers.

[1] Teegalapalli, K. & Datta, A. Ambio (2016), 'Shifting to settled cultivation: Changing practices among the *Adis* in Central Arunachal Pradesh, north-east India', Ambio, A Journal of Human Environment, September 2016, Volume 45, Issue 5, pp 602–612.

The unchanged practices may be due to fact that they find the practices more sustainable. It is painful when somebody says the tribes are backward or primitive. It not only affects the sentiments of the clientele group but also equally affect the organizations working in those areas for their development. Hence, the technology should be transferred to them without affecting their sentiment. A number of appropriate technologies are generated by them and have become sustainable under their farming system.

Agriculture has changed dramatically, especially since the end of World War-II (Adam Thomas, 2015)[2]. Food and fiber productivity soared due to new technologies, mechanization, increased chemical use, specialization and government policies that favored maximizing production. These changes allowed fewer farmers with reduced labor demands to produce the majority of the food and fiber in all over the world.

Although these changes have had many positive effects and reduced many risks in farming, there have also been significant costs. Prominent among these are topsoil depletion, groundwater contamination, the decline of family farms, continued neglect of the living and working conditions for farm laborers, increasing costs of production, and the disintegration of economic and social conditions in rural communities.

A growing movement has emerged during the past two decades to question the role of the agricultural establishment in promoting practices that contribute to these social problems. Today this movement for sustainable agriculture is garnering increasing support and acceptance within mainstream agriculture. Not only does sustainable agriculture address many environmental and social concerns, but it offers innovative and economically viable opportunities for growers, laborers, consumers, policymakers and many others in the entire food system.

This chapter is an effort to identify the ideas, practices and policies that constitute our concept of sustainable agriculture. We do so for two reasons: 1) to clarify the research agenda and priorities and 2) to suggest practical steps that may be appropriate for them in moving toward sustainable agriculture. Because the concept of sustainable agriculture is still evolving, the intention is not to be construed as final.

Plant Production Practices

Sustainable production practices involve a variety of approaches. Specific strategies must take into account topography, soil characteristics, climate, pests, local availability of inputs and the individual grower's goals. Despite the site-specific and individual nature of sustainable agriculture, several general principles can be applied to help growers select appropriate management practices:

[2] Adam Thomas (2015), Sustainable Agriculture, http://slideplayer.com/slide/8132614/

Selection of species and varieties that is well suited to the site and to conditions on the farm;

- Diversification of crops (including livestock) and cultural practices to enhance the biological and economic stability of the farm;
- Management of the soil to enhance and protect soil quality;
- Efficient and humane use of inputs; and
- Consideration of farmers' goals and lifestyle choices.

Selection of Site, Species and Variety

Preventive strategies, adopted early, can reduce inputs and help establish a sustainable production system. When possible, pest-resistant crops should be selected which are tolerant of existing soil or site conditions. When site selection is an option, factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) should be taken into account before planting.

Diversity

Diversified farms are usually more economically and ecologically resilient. While monoculture farming has advantages in terms of efficiency and ease of management, the loss of the crop in any one year could put a farm out of business and/or seriously disrupt the stability of a community dependent on that crop. By growing a variety of crops, farmers spread economic risk and are less susceptible to the radical price fluctuations associated with changes in supply and demand.

Properly managed, diversity can also buffer a farm in a biological sense. For example, in annual cropping systems, crop rotation can be used to suppress weeds, pathogens and insect pests. Also, cover crops can have stabilizing effects on the agro ecosystem by holding soil and nutrients in place, conserving soil moisture with mowed or standing dead mulches, and by increasing the water infiltration rate and soil water holding capacity. Cover crops in orchards and vineyards can buffer the system against pest infestations by increasing beneficial arthropod populations and can therefore reduce the need for chemical inputs. Using a variety of cover crops is also important in order to protect against the failure of a particular species to grow and to attract and sustain a wide range of beneficial arthropods.

Optimum diversity may be obtained by integrating both crops and livestock in the same farming operation. This was the common practice for centuries until the mid-1900s when technology, government policy and economics compelled farms to become more specialized. Mixed crop and livestock operations have several advantages. First, growing row crops only on

more level land and pasture or forages on steeper slopes will reduce soil erosion. Second, pasture and forage crops in rotation enhance soil quality and reduce erosion; livestock manure, in turn, contributes to soil fertility. Third, livestock can buffer the negative impacts of low rainfall periods by consuming crop residue that in "plant only" systems would have been considered crop failures. Finally, feeding and marketing are flexible in animal production systems. This can help cushion farmers against trade and price fluctuations and, in conjunction with cropping operations, make more efficient use of farm labor.

Soil Management

A common philosophy among sustainable agriculture practitioners is that a "healthy" soil is a key component of sustainability; that is, a healthy soil will produce healthy crop plants that have optimum vigor and are less susceptible to pests. While many crops have key pests that attack even the healthiest of plants, proper soil, water and nutrient management can help prevent some pest problems brought on by crop stress or nutrient imbalance. Furthermore, crop management systems that impair soil quality often result in greater inputs of water, nutrients, pesticides, and/or energy for tillage to maintain yields.

In sustainable systems, the soil is viewed as a fragile and living medium that must be protected and nurtured to ensure its long-term productivity and stability. Methods to protect and enhance the productivity of the soil include using cover crops, compost and/or manures, reducing tillage, avoiding traffic on wet soils, and maintaining soil cover with plants and/or mulches. Conditions in most California soils (warm, irrigated, and tilled) do not favor the buildup of organic matter. Regular additions of organic matter or the use of cover crops can increase soil aggregate stability, soil tilth, and diversity of soil microbial life.

Seeds Management

Ragi: The tribals store these seeds in the dried long ground/bottle ground after taking the seeds of the long ground. This is one of the way to prevent the seeds form worms and other insects.

Red Grams / Black Grams: These kinds of seeds are store after drying then under the hot sun and they are mixed with the ashes of the burned the waste tress in the forest. This is one of the methods to store these kinds of seeds.

Ginger / Turmaric: These are stored in any corner of the house in a pit and the procedure for the storage of these seeds is wrapping the paddy grass all around the pit and they pour the seeds in the pit to the brim of the pit then it is closed again with the dried paddy grass and pit is enclosed with dung of the cattle. By following these procedure the seeds are prevented drying and other damages.

Maize / Millet / Saamalu / Gantelu: These seeds are without separating from the ear of corn, they are collected in a sacket and it is tied exactly about the burning over, in order to get some warmness to the fait sacket.

Paddy: These are stored in a room made of wood or bamboo sticks in the house.

Efficient use of inputs

Many inputs and practices used by conventional farmers are also used in sustainable agriculture. Sustainable farmers, however, maximize reliance on natural, renewable, and on-farm inputs. Equally important are the environmental, social, and economic impacts of a particular strategy. Converting to sustainable practices does not mean simple input substitution. Frequently, it substitutes enhanced management and scientific knowledge for conventional inputs, especially chemical inputs that harm the environment on farms and in rural communities. The goal is to develop efficient, biological systems which do not need high levels of material inputs.

Growers frequently ask if synthetic chemicals are appropriate in a sustainable farming system. Sustainable approaches are those that are the least toxic and least energy intensive, and yet maintain productivity and profitability. Preventive strategies and other alternatives should be employed before using chemical inputs from any source. However, there may be situations where the use of synthetic chemicals would be more "sustainable" than a strictly nonchemical approach or an approach using toxic "organic" chemicals. For example, one grape grower switched from tillage to a few applications of a broad spectrum contact herbicide in the vine row. This approach may use less energy and may compact the soil less than numerous passes with a cultivator or mower.

Agricultural policy and development

Existing federal, state and local government policies often impede the goals of sustainable agriculture. New policies are needed to simultaneously promote environmental health, economic profitability, and social and economic equity. For example, commodity and price support programs could be restructured to allow farmers to realize the full benefits of the productivity gains made possible through alternative practices. Tax and credit policies could be modified to encourage a diverse and decentralized system of family farms rather than corporate concentration and absentee ownership. Government and land grant university research policies could be modified to emphasize the development of sustainable alternatives. Marketing orders and cosmetic standards could be amended to encourage reduced pesticide use. Coalitions must be created to address these policy concerns at the local, regional, and national level.

Farming and Natural Resources

Water

In some areas sufficient rainfall is available for crop growth, but many other areas require irrigation. For irrigation systems to be sustainable, they require proper management and must not use more water from their source than is naturally replenished. Otherwise, the water source effectively becomes a non-renewable resource. Improvements in water well drilling technology and submersible pumps, combined with the development of drip irrigation and low pressure pivots, have made it possible to regularly achieve high crop yields in areas where reliance on rainfall alone had previously made successful agriculture unpredictable. However, this progress has come at a price. In many areas, such as the agency areas, the water is being used faster than it can be recharged.

Several steps must be taken to develop drought-resistant farming systems even in normal years with average rainfall. These measures include both policy and management actions: 1) improving water conservation and storage measures, 2) providing incentives for selection of drought-tolerant crop species, 3) using reduced-volume irrigation systems, 4) managing crops to reduce water loss, or 5) not planting crops at all.

When the production of food and fiber degrades the natural resource base, the ability of future generations to produce and flourish decreases. The decline of ancient civilizations in hill and forest regions are believed to have been strongly influenced by natural resource degradation from non-sustainable farming and forestry practices. Water is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged.

Another way in which agriculture affects water resources is through the destruction of riparian habitats within watersheds. The conversion of wild habitat to agricultural land reduces fish and wildlife through erosion and sedimentation, the effects of pesticides, removal of riparian plants, and the diversion of water. The plant diversity in and around both riparian and agricultural areas should be maintained in order to support a diversity of wildlife. This diversity will enhance natural ecosystems and could aid in agricultural pest management.

Energy

Modern agriculture is heavily dependent on non-renewable energy sources, especially petroleum. The continued use of these energy sources cannot be sustained indefinitely, yet to abruptly abandon our reliance on them would be economically catastrophic. However, a sudden cutoff in energy supply would be equally disruptive. In sustainable agricultural systems, there is

reduced reliance on non-renewable energy sources and a substitution of renewable sources or labor to the extent that is economically feasible.

Air

Many agricultural activities affect air quality. These include smoke from agricultural burning; dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer. Options to improve air quality include incorporating crop residue into the soil, using appropriate levels of tillage, and planting wind breaks, cover crops or strips of native perennial grasses to reduce dust.

Soil

Soil erosion continues to be a serious threat to our continued ability to produce adequate food. Numerous practices have been developed to keep soil in place, which include reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch. Enhancement of soil quality is discussed in the next section.

Sustainable Agriculture

Sustainable agriculture integrates three main goals--environmental health, economic profitability, and social and economic equity. A variety of philosophies, policies and practices have contributed to these goals. People in many different capacities, from farmers to consumers, have shared this vision and contributed to it. Despite the diversity of people and perspectives, the following themes commonly weave through definitions of sustainable agriculture.

Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, stewardship of both natural and human resources is of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of laborers, the needs of rural communities, and consumer health and safety both in the present and the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term.

A systems perspective is essential to understanding sustainability. The system is envisioned in its broadest sense, from the individual farm, to the local ecosystem, and to communities affected by this farming system both locally and globally. An emphasis on the system allows a larger and more thorough view of the consequences of farming practices on both human communities and the environment. A systems approach gives us the tools to explore the interconnections between farming and other aspects of our environment.

A systems approach also implies interdisciplinary efforts in research and education. This requires not only the input of researchers from various disciplines, but also farmers, farm workers, consumers, policymakers and others.

Making the transition to sustainable agriculture is a process. For farmers, the transition to sustainable agriculture normally requires a series of small, realistic steps. Family economics and personal goals influence how fast or how far participants can go in the transition. It is important to realize that each small decision can make a difference and contribute to advancing the entire system further on the "sustainable agriculture continuum." The key to moving forward is the will to take the next step.

Finally, it is important to point out that reaching toward the goal of sustainable agriculture is the responsibility of all participants in the system, including farmers, laborers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

The strategies can be grouped according to three separate though related areas of concern: Farming and Natural Resources, Plant and Animal Production Practices, and the Economic, Social and Political Context. They represent a range of potential ideas for individuals committed to interpreting the vision of sustainable agriculture within their own circumstances. These aspects have been Juxtaposed in the exopping patterns, environmental concerns, soll conservation and economic ability of the trial formers in the villages under present study.

Table – 1: Crop-wise extent of land particulars in selected mandals of Visakhapatnam district agency area

(in hectares)

Sl. No.	Name of the crop	Hukumpeta		Chinthapalli	
		Normal area	Area covered	Normal area	Area covered
1	Maize	171	337	1744	1907
2	Jowar	-	-	40	65
3	Black Gram	13	-	-	-
4	G. Nut	-	40	-	-
5	Ragi	2749	2556	1955	1955
6	Korra	-	39	9	9
7	Sama	1389	1036	2298	2490
8	Greengram	10	-	-	-
9	Cow Gram	25	-	1	4
10	Red Gram	81	69	288	279
11	Other Pulses	115	91	28	28
12	Chilies	88	86	15	15
13	Turmeric	-	203	-	-
14	Ginger	-	386	-	-
15	Pippalamodi	-	328	-	-
16	Mango	63	31	18	18
17	Banana	15	9	-	-
18	Cashew	14	4	-	-
19	Mulberry	-	-	15	15

Source: District Statistical Handbook of Visakhapatnam, 2015.

The crop-wise extent of land particulars of Hukumpeta mandal shows that the large covered area and normal area is Ragi with 2749 and 2556 hectares respectively. Whereas in Chintapalli mandal the large covered area and normal area is Sama, where the normal area is 2298 hectares and covered area is 2490 hectares. The other crops are also cultivating in both the mandals with a limited area. Some of the commercial crops like chilies, turmeric, ginger, cashew, mulberry etc., are also cultivating in these mandals. Hence, the crop-wise extent of land particualrs in the study mandals indicate that in selected two mandals the surveyed households are cultivating Maize, Ragi, Sama, Red Gram, Chilies and mango, whereas Turmeric, Ginger, Pippalamodi crops found to some extent of land in Hukumpeta mandal. In addition to these banana and cashew crops found in Hukumpeta mandal and mulberry crop found in Chinthapalli mandal.

Table – 2: Crop-wise extent of land particulars during Rabi season in selected mandals of Visakhapatnam district agency area

(in hectares)

Sl. No.	Name of the crop	Hukumpeta		Chinthapalli	
		Normal area	Area covered	Normal area	Area covered
1	Paddy	146	148	-	-
2	Niger	3456	3302	603	650
3	Chillies	-	85	20	20
4	Rajmabeans	-	-	217	500
5	Vegetables	-	98	-	-
6	Tobacco	-	-	4	4

Source: District Statistical Handbook of Visakhapatnam, 2015.

The crop-wise extent of land particulars during Rabi season in selected mandals of agency area shows that the Niger crop is cultivated in a large area in both the mandals where in Hukumpeta mandal it is 3456 hectares normal area and 3302 hectares covered area, in Chintapalli mandal the normal area of this crop is 603 hectares and covered area is 650 hectares. The paddy and vegetables are cultivating in Hukumpeta mandal and Rajmabeans and tobacco are cultivating in Chitapali mandal only. Hence, the crop-wise extent of land particualrs in Rabi season in all the above said two mandals shows that Paddy, Niger and Vegetables are cultivating in a large area and chillies and Rajma beans are also other crops which are cultivating during Rabi season in all the selected two mandals.

Table – 3: Crop-wise extent of land particulars during Kharif season in selected mandals of Visakhapatnam district agency area

Sl. No.	Name of the crop	Hukumpeta		Chinthapalli	
		Normal area	Area covered	Normal area	Area covered
1	Chilies	88	86	15	15
2	Turmeric	-	203	-	-
3	Ginger	-	386	-	-
4	Pippalamodi	-	328	-	-
5	Mango	63	31	18	18
6	Banana	15	9	-	-
7	Cashew	14	4	-	-
8	Mulbery	-	-	15	15

Source: District Statistical Handbook of Visakhapatnam, 2015.

The crop-wise extent of land particulars during Kharif season in selected mandals of agency area shows that the Chilies and Mangoes are cultivating in both the mandals where in Hukumpeta mandal the chilies covered by 86 hectares whereas, in Chintapalli mandal it is covered by only in 15 hectares. The mangoes in Hukumpeta mandal covered by 31 hectares and in Chintapalli it is covered 18 hectares only. In addition to these crops Turmeric, Ginger, Pippalamodi, Banana and Cashew are cultivating in Hukumpeta mandal ovely. Hence, the crop-wise extent of land particulars during Kharif season in all the four villages shows that Turmaric, Pippalamodi and Ginger are the major crops are cultivating in a large area during this season, whereas, Chilies also

cultivate in some extent of land but mando crops which is cultivating in a limited extent of land during Kharif season in all the selected two mandals.

Table – 5: Anticipated productivity and production of crops in selected mandals of Visakhapatnam district agency area

Sl. No	Name of the crop	Hukumpeta		Chinthapalli	
		Productivity in quintals	Production in Hectares	Productivity in quintals	Production in Hectares
1	Paddy-Wet	1993	1380	780	-
2	Dry	825	550	-	-
3	Maize	2188	1260	800	-
4	Ragi	600	410	485	-
5	Groundnut	991	920	-	-
6	Redgram	703	550	170	-
7	Jowar	586	440	220	-
8	Niger	400	310	197	-
9	Korra	-	-	450	-
10	Sama	-	-	210	-
11	Cowgram	-	-	200	-

Source: District Statistical Handbook of Visakhapatnam, 2015.

The anticipated productivity and production of crops in selected mandals shows that Paddy-Wet & Dry, Maize, Ragi, Groundnut, Redgram, Jowar and Niger crops are cultivating in Hukumpeta mandal. Whereas, in Chintapalli mandal Paddy-wet, Maize, Ragi, Redgram, Jowar and Niger Korra, Sama and Cowgram crops are cultivating. Hence, the anticipated production of cropped are in the study villages shows that the paddy in wet lands is dominating with other crops which is followed by Ragi, Maiza, Groundnut, Redgram, Jowar etc., and the other crops like Niger, Sama etc. are also other crops cultivate in the selected two mandals.

In agency area of Visakhapatnam district, an extensive water storage and transfer system has been established which has allowed crop production to expand to very arid regions. In drought years, limited surface water supplies have prompted overdraft of groundwater and consequent intrusion of salt water, or permanent collapse of aquifers. Periodic droughts, some lasting few years, have occurred in this area. The people of these areas follow two seasons in propping pattern according to the availability of water. These two seasons are Rabi and Kharif. The cropping pattern of the selected mandals has been shown in the following table.

Table – 6: Area under principal crops, fruits & vegetables and florie culture, season-wise in selected mandals during 2014-15

Sl. No	Item		Hukumpeta	Chinthapalli
1	Rice	Kharif	6227	4165
		Rabi	15	35
2	Jowar	Kharif	-	60
		Rabi	-	-
3	Maize	Kharif	102	1821
		Rabi	-	-
4	Ragi	Kharif	1576	1731
		Rabi	-	-
5	Red Gram	Kharif	55	32
		Rabi	-	-
6	Cow Gram	Kharif	14	-
		Rabi	-	-
7	Total Pulses	Kharif	69	32
		Rabi	-	374
8	Total Food Grains	Kharif	8181	9827
		Rabi	15	409
9	Turmeric	Kharif	146	35
		Rabi	-	-

Source: District Statistical Handbook of Visakhapatnam, 2015.

The most important issues related to water quality involve salinization and contamination of ground and surface waters by pesticides, nitrates and selenium. Salinity has become a problem wherever water of even relatively low salt content is used on shallow soils in arid regions and/or where the water table is near the root zone of crops. Tile drainage can remove the water and salts, but the disposal of the salts and other contaminants may negatively affect the environment depending upon where they are deposited. Temporary solutions include the use of salt-tolerant crops, low-volume irrigation, and various management techniques to minimize the effects of salts on crops. In the long-term, some farmland may need to be removed from production or converted to other uses. Other uses include conversion of row crop land to production of drought-tolerant forages, the restoration of wildlife habitat or the use of agro forestry to minimize the impacts of salinity and high water tables.

Land use pattern

As the global population increases and demand for food increases, there is pressure on land resources. Land can also be considered a finite resource on Earth. Expansion of agricultural land has an impact on biodiversity and contributes to deforestation. The Food and Agriculture Organisation estimates that in coming decades, cropland will continue to be lost to industrial and urban development, along with reclamation of wetlands, and conversion of forest to cultivation, resulting in the loss of biodiversity and increased soil erosion (FAO, 2011).

There is a rapid growth of conversion of agricultural land to other utilities like industrialization, urbanization, etc., are escalating the land values threaten farming on prime soils. Existing farmland conversion patterns often discourage farmers from adopting sustainable practices and a long-term perspective on the value of land. At the same time, the close proximity of newly developed residential areas to farms is increasing the public demand for environmentally safe farming practices. By helping farmers to adopt practices that reduce chemical use and conserve scarce resources, sustainable agriculture research and education can play a key role in building public support for agricultural land preservation. Even though in agency areas the land use pattern is not much difference. Hence, the following table will shows the land use pattern of the study mandals in Visakhapatnam agency.

Table – 7: Land utilisation particulars in agency area of Visakhapatnam district

(in hectares)

S. No	Category	2012-13	2013-14	2014-15
1	Total geographical area	1116101	1116100	1116100
2	Forests	441166	441166	441166
3	Barren & uncultivable land	130405	130405	130405
4	Land put to non-agricultural uses	102891	102891	106854
5	Cultivable waste	11686	10863	10863
6	Permanent pastures and other grazing lands	3269	2849	2849
7	Land under miscellaneous tree crops & groves not' included in net area sown	34077	34605	34605
8	Current fallows	49018	56881	103444
9	Other fallow lands	31278	28325	28346
10	Net area sown	312068	307872	257325
11	Total cropped area	384430	379927	315388
12	Area sown more than once	72350	72055	58063
13	Fish & Prawn culture	243	243	243

Source: District Statistical Handbook of Visakhapatnam, 2015.

As per the table the land utilization particulars in agency area of Visakhapatnam district during 2009-2012 shows that the forest area, Barren & uncultivable land and Fish & Prawn Culture did not change, but the land utilization under Current Fallows, Land put to non-agricultural uses, Land under miscellaneous tree crops & groves not' included in net area sown are increased during this period. On the other hand Permanent pastures and other grazing lands, Total Cropped Area, Net Area Sown are decreased.

Table – 8: Land utilisation particulars of selected mandals in agency area

(in hectares)

Sl. No	Item	Hukumpeta	Chinthapalli	Total
1	Geographical area	42928	69271	112199
2	Forest land	22253	50042	72295
3	Barren and uncultivable land	6742	3601	10343
4	Land put no Agriculture purpose	727	945	1672

5	Permanent pasture & grazing land	36	919	955
6	Miscellaneous crops	308	582	890
7	Cultivable waste	270	192	462
8	Other fallow land	8	-	8
9	Current fallow land	340	610	950
10	Net Area sown	12234	12378	24612
11	Total cropped area	13743	13240	26983
12	Area sown more than once	1508	862	2370

Source: District Statistical Handbook of Visakhapatnam, 2015.

As per the table the land utilization particulars in study mandals of Visakha agency during 2009-2012 shows that the geographical area is increased, which leads to increase in forest land, Barren & uncultivable land, land put on agriculture, Permanent pasture Grazing land, Miscellaneous crops, Cultivable waste etc. On the whole, the total cropped area along with net shone area also increased.

Sustainable Development

Agriculture is the most primitive occupation of the tribal people. Though the people had changed their cultivation pattern from traditional cultivation to modern cultivation, but some of the practices have remained unchanged among many groups of farmers. The unchanged practices may be due to fact that they find the practices more sustainable. Hence, the technology should be transferred to them without affecting their sentiment. A number of appropriate technologies are generated by them and have become sustainable under their farming system. All these changes have many positive effects which reduced many risks in farming, there have also been significant costs. Prominent among these are topsoil depletion, groundwater contamination, the decline of family farms, continued neglect of the living and working conditions for farm laborers, increasing costs of production, and the disintegration of economic and social conditions in rural communities.

Hence, it is observed from the study that the movement for sustainable agriculture is garnering increasing support and acceptance within mainstream agriculture. Making the transition to sustainable agriculture process in tribal areas, the farmers normally requires a series of small, realistic steps. Here, the family economics and personal goals of these vulnerable groups influence how fast or how far they can go in the transition. It is important to realize that each small decision can make a difference and contribute to advancing the entire system further on the sustainable agriculture continuum.

It is also important to point out that reaching toward the goal of sustainable agriculture in tribal areas is the responsibility of all participants in the system, including farmers, laborers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

Conclusions

Traditional agriculture was an important practice in the region both from socioeconomic and ecological points of view. The local knowledge in traditional agriculture is a significant feature in the villages. Mixed cropping, crop rotation, and mulching were some of the scientific practices in traditional agriculture. However, agriculture was more. or less of subsistence type. But over the years, this agricultural practice is being sidelined by modern agricultural practice. No doubt farmers are rational in selection of crops or technologies, but their rationalities are influenced by the available local resources around them and the service provisions by public and private agencies for agricultural development. Many farmers are very eager to preserve their traditional agricultural practices but the present scenario does not allow them to do so. Shifting cultivation has been banned. But no alternative support for this traditional crop production is provided to them. Despite that, a few people continue the production of traditional crops such as kandi, turmeric, etc. The farmers feel that the productivity has been declined due to change in soil quality and increase in pest and insect attack on the crops. Secondly, there is no better marketing support for these crops from which a farmer can get reasonable price for his produce. Traditional crops like ginger have lost the ground. The fanners find rottenness of the tuber despite their frequent effort to `get rid of it. No institutional support has been effective to the ginger growers in these villages. So the present situation shows that there is threat to traditional crops while they are not getting full benefits from modern crops. The contemporary scenario of agricultural practices has undergone changes. There is transfer of technology to farmers in different means. Farmers are the real transmitter of knowledge, which has already been described. Many farmers have been selective and rational in selection of technology and crops. At Present, Vegetable cultivation is an alternative source to get income support among the farmers. Some medium and large farmers have been successful oil the modern agricultural practice. But the marginal and poor farmers have not been benefited out of this. The involvement of public and private agencies is not so effective in development of agriculture. The agencies are less eager to understand the needs of the communities in the region. There is no equity in distribution of services both communities and villages wise.

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