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Prominent weeds in Cereal fodder

Ker (Caper berry)

Useful Arid Region Plant

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Module for Increasing Farm Income By 2022

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India is a land of agriculture where millions of people depend on agriculture for their livelihood. Now a days the agriculture land in shrinking and population is increasing in a higher rate, thus to meet the requirement and demand of the growing population tremendous development in the field of agriculture research has been done in terms of the technology generation, production of crop hybrids for higher productivity, improvement and modification of Agri-implements for increasing mechanical/operational efficiency in the field of agriculture but still farmers of our nation faces severe challenges due to climate change, global warming, weather hazards, expensive agriculture practices due to higher rate of input and agriculture materials, labour migration etc. Though many a times researches exports scientists have proved agriculture as profitable business but down line the fate of millions farmers is still in dark may be due to lack of knowledge on technological backstopping or proper implementation/execution of technological advisory or lack of motivational forces the farmers by which he could not harness optimum benefits from out of limited resources.

Focusing on all these limitation and draw backs of our farmers society a module has been developed for farmers of Kalahandi district understanding ecology, agro-climatic situation, soil and land type and crops grown etc. for doubling the farmer income by 2022.

Module –I

Module 1 has been developed for rainfed eco-system (Upland, Medium land & low land) intervention activity will carried outat Bhawanipatna, Kesinga and Lanjigarh block. Technology intervention will be on on crop diversification in upland through high yielding pigeon pea (var. ICPL -87119), intercropping of cotton and Arhar with 8 : 2, cultivation of Kharif Onion (var-AFDR), Cultivation short duration paddy (var. Jogesh, Manoswani) and proper utilization of Rice fallow by cultivation Green gram as a second crop in available soil moisture with proper YMV management micro-nutrient application and training will be imparted on IPM & INM packages.

Further Module has been developed for homested land and technology

intervention will be on deworming of kids with proper vaccination scheduled and supply of mineral mixture for optimum growth rate of goatery population. Breed replacement of poultry breed with pallishree and Banaraja breed for backward poultry rearing with proper technical guidance through Training, method demonstration & field day etc. Introduction of mushroom cultivation in small scale for providing ground the year income by mobilizing agriculture waste with minimum capital.

Moodule-II

Module to has been developed for irrigated eco-system and the interventions will executed and Dharmagarh Block. Interventions on cultivation of paddy variety (Shabhagi Dhan) along with herbicide application to control weed population, cultivation of scented rice, introduction of Tomato (BT-136), application of growth regulator for higher for better fruit setting, introduction of Hybrid sunflower with micro-nutrient application and cultivation of water melon and Rabi ground nut will be promoted, fodder cultivation, breed up gradation will be taken up. Breed replacement of poultry bred with pallishree and Banaraja breed for backward poultry rearing with proper technical guidance through Training, method demonstration & field day etc.

CROP DIVERSIFICATION: FOR PROFITABILITY, FOOD AND NUTRITIONAL SECURITY

Name and Address of the Farmer

Name : Sri, Indu Bhusan Swain
Village: Boria
Block : Kesinga
District: Kalahandi

Enterprise: Paddy, Pigeon pea, Banana and Cotton

Background Information:

Kalahandi is a tribal dominated district of Odisha and majority of the population depend on agriculture as their primary source of livelihood. Village Boria is situated at 30 km away from Bhawanipatna. Paddy is the only crop was grown during Kharif. During a diagnostic visit the scientist encouraged the farmers to go for low value to high value crops and from high water requiring crops to low water requiring crops. Along with Paddy in Kharif some pulses, oilseed, short duration fruits and vegetables can also be grown which has higher profitability and production potentiality that can play a big role in changing their livelihood besides providing nutritional security. During 2012-13, Pigeon pea Var. ICPL 87-119 was demonstrated in the farmers field of that village.

Sj. Indu Bhusan Swain, one of the farmers of the village was earning his livelihood from 16 acres of land. Due to traditional method of rice cultivation and poor crop productivity, he was not satisfied with the lower income. He used to cultivate only paddy both in the upland and low land. Sri Swain, after consulting with the KVK Scientists, was convinced to grow pigeon pea, cotton and banana along with Kharif paddy. He grows paddy, banana and cotton in 5 ac, 10 ac and 1 ac area respectively.

Description of the Technology:

Arhar : Line sowing of Pigeon pea (Var. ICPL 87-119) seeds (45 X30cm) ,Seed treatment with Rhizobium culture (1kg seed @ 20gms of culture) , Application of

Crop	Area (ha)	Yield (Q/ha)	Cost of cultivation (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs./ha)	Total Gross income (Rs.)	Total Net Income (Rs.)	BC Ratio
Rice	2.0	35	21,500	35,000	13,500	70,000	26,000	1.62
Arhar	5.0	15	25,000	73,500	48,500	3,67,500	2,42,500	2.94
Banana	1.0		1,00,000	2,50,000	1,50,000	2,50,000	1,50,000	2.50
Cotton	0.4	17.5	22,000	68,250	46,250	27,300	8800	3.10
TOTAL						7,14,800	4,27,300	

NPK @20:40:20 kg/ha as basal application, Weed management after 21 days of sowing ,Spraying of Chloropyriphos (2ml/lt of water) and planofix hormone (1 ml /4lit of water).

Banana and Cotton: Crop cultivation with complete Package of Practice.

Dissemination of Technology:

Capacity building through training, FLD OFT and other extension activities,Diagnostic visit of KVK Scientist time to time, Method demonstration showcasing all the package of practices, Distribution of extension literature on management practices of Pigeon pea, banana and cotton etc. ATMA (Dept.of Agriculture) and Horticulture (under NHM), also extended their helping hand by providing frequent training programmes to update their knowledge level and different , Linkage with ICRISAT, Department of Horticulture and Agriculture was facilitated for inputs and all Govt. supports.

Success Point:

Arhar: On time sowing of the seed and seed treatment with Rhizobium culture, Application of recommended dose of fertilizer, Optimum care during critical growth stage of the crop, IPM and Weed management, Increase in knowledge and exposure to new technologies.

Banana and Cotton:

Adoption of improved technologies like proper planning, layout, planting, INM, IPM, etc. in banana and cotton. Marketing information gave him a great support to sell the harvested produce, which earned him maximum rates and fetches good profits. Shifted from monoculture of paddy cultivation to Arhar, Cotton and Banana cultivation.

Outcome

Productivity of Pigeon pea (Asha) recorded a higher yield of 30.4 % over local variety. He got a net profit of Rs. 4, 27,300/- per year.

IMPACT

Horizontal expansion of pigeon pea is remarkable. Area of Pigeon pea has been increased from 5 ha to 80 ha. Farmers are now much aware to produce the HYV of Pulses rather than local degenerated variety. Area under tissue culture banana and cotton also enhanced in Boria and nearby villages. Net income of Sri, Swain is Rs. 4, 27,300/- (Rice, Arhar, Banana and Cotton). By seeing his success farmers are shifting from monoculture paddy cultivation to Pulse (Arhar), Banana and cotton cultivation. Farmers from inside,

outside the district and also from outside states are visiting his farm and he became a source of inspiration for others.

INTEGRATED FARMING SYSTEM- A MILESTONE OF SUCCESS

Name of the farmer: Prahlad Budhia
At- Kanakpur
Block: Bhawanipatna
Dist: Kalahandi (Odisha)
Mob. No: 8018698722 / 7894581168

Background Information

Village Kanakpur of Bhawanipatna block of Kalahandi district is just 8 km away from Bhawanipatna town. Agriculture is a primary source of income for the farming community of Kanakpur village. The existing farming system in the village was agriculture + dairying, where primary source of income was agriculture enterprise particularly from commodities like paddy.After KVK's intervention the farming systems was transformed to agriculture + horticulture + animal husbandry. Where horticulture crop became a primary source of income i.e banana,ridgegourd, bittergourd, cucumber, cowpea, brinjal, tomato,etc grown on in commercial basis which adds significant contribution to their income. Above all the members have shown a positive attitude towards change in the existing farming systems.

Description of the Technology:

Seed production in Paddy.
Papaya cultivation (KVK intervention during 2012-13)-Looking at the potential of papaya cultivation in the village and his interest, KVK Scientist advised him to go for developing a small papaya orchard orchard in his 0.4 ha of upland with a spacing of 1.5.m x 1.5 m.Banana cultivation (PoP of Tissue culture) with utillization of the interspaces with off season vegetables like tomato, ridge gourd, cowpea, bitter gourd, cucumber etc.Pisciculture, Milk and paneer preparation, Hybrid Paddy cultivation, Dairy with cross breed cows

Disemination of the Technology :

- Capacity building through Training, FLD, OFT and other extension activities by KVK.
- Involved in different FLD & OFT programmes of KVK
- Diagnostic visit of KVK Scientist time to time
- Exposure visit by KVK and other line department
- Method demonstration showcasing all the package of practices
- Distribution of extension literature on management practices of papaya, cucurbits, banana etc.
- Training was conducted where nearby farmers also participated to notice the benefit out of IFS.
- ATMA(Dept.of Agriculture) and Horticulture (under NHM), also extended their helping hand to the interested farmers by providing frequent training programmes to update their knowledge level.

Institutes involved :

Krishi Vigyan Kendra, Kalahandi
Horticulture Department – National Horticulture Mission
Agriculture Department , Kalahandi
RRTTS, Bhawanipatna

Success Point

- Equal emphasis is given to all the component of the farming system.

- All the sound technology has been completed in time.
- Increased in knowledge and exposed to new technologies Adopt IFS model
- Shifted from paddy cultivation to Paddy + Diary + Horticulture (Fruit & Vegetable)+ Pisciculture.

Impact :

By seeing his success farmers are shifting from monoculture paddy cultivation to horticulture based farming system. Farmers also include new enterprise like dairy and poultry with their paddy-paddy farming system. Income substantially increased with technological intervention in sustainable manner. Many farmers of the district have been motivated by his success and some farmers with av. holding size of 2.0 ha. have adopted fruit and vegetable based farming model with input assistance like drip irrigation, bore well, weeders, Poly house etc. from ATMA & NHM schemes of the district. KVK has maintained regular liasoning with them.

Outcome

Sl. No	Enterprises	Area (acre)	Season	Yield (Q)	Cost of cultivation (Rs)	Gross return(Rs)	Profit (Rs)	B:C ratio
1	Paddy	1.5	Kharif	40	16,000	40,000	24,000	2.5
2	Banana	0.5	Kharif	500 bunches	27,500	75,000	47,500	2.72
3	Papaya	0.15	Kharif	79.8	15,000	79,800	64,800	4.65
4.	Sugarcane	0.2	Kharif	20,000 (canes)	20,000	52,000	32,000	2.6
5.	Tomato	0.2	Rabi	29	10,000	30,000	20,000	3.0
5	Brinjal	0.25	Rabi	20	9,000	32,000	23,000	3.5
6	Cowpea + Beans	0.2	K + R	15 11	14,000	40,000	26,000	2.85
7	Ridge gourd	0.2	Kharif	20	11000	25000	14,000	2.27
8	Cucumber	0.3	Kharif	20	7,000	20,000	13,000	2.85
9	Fishery	0.5	Kharif	4.0 q	6,000	18,000	12,000	3.6
10	Diary	2 nos.	--	8.0 lit/day	5,000	28,800	23,800	5.76
	Total				1,40,500	4,40,600	3,00,100	3.13

Back Yard Poultry Farming: A Sustainable Alternative Employment Opportunity

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With the annual production of 65 billion eggs, India is the third largest egg producing country in the world. Even amidst successful commercialization of the poultry sector in India, century-old, traditional Backyard Poultry Farming (BYPF) still contributes significantly in national egg production. Government of India (GoI) has also recognized the prospect of small-scale poultry sector for poverty reduction and animal protein supplementation (GoI, 2005; 2008). BYPF has a significant role in achieving this goal apart from being compatible to the social and cultural aspects of rural poor (FAO, 2010). Though major share of the poultry products come from commercially reared improved breed birds, indigenous source of poultry eggs and meat are always appreciated for their taste and texture, in both rural and organised developed markets. Market studies show prices per kg live weight for these birds can be 50 –100 % higher than that of industrially produced birds. Though rural backyard poultry is the most potent source for subsidiary incomes for landless poor farmers, it has always been neglected. This is in spite of the fact that their products carry a much higher price than that from commercial poultry. There are plenty of evidence to demonstrate the role of rural backyard poultry husbandry in elevating the food and nutrition security of the poorest households and reducing the livelihood insecurity. Backyard poultry is a potent tool for upliftment of poor because it requires hardly any infrastructure set-up. Besides income generation and poverty reduction, Rural backyard poultry can provide nutrition supplementation in the form of valuable animal protein.

Background:

Pipalpada Village of Lanjigarh block of Kalahandi district is just 45 km away from Bhawanipatna town. Agriculture is the primary source of income for the farming community of Pipalpada village. The existing farming system in the village was agriculture with animal husbandry, where primary source of income was agriculture and allied enterprise particularly from

Table- 1. Cost-Benefit Analysis

Sl. No	Enterprises	Area (acre)	Season	Yield(Q)	Cost of cultivation (Rs)	Gross return (Rs)	Profit (Rs)	B:C ratio
1.	Paddy	2	Kharif	28	16000	33600	17600	2.1
2.	Cotton	3	Kharif	18	32000	81000	49000	2.5
3	Vanaraja bird	40 nos.	--	600 nos. egg/Bird/Year	--	3000	3000 6950	4.98
				Sold 35 no of poultry bird@180/kg (approximately each bird will be 1.5 kg after 6months)	2500	9450		
	Total				**50500**	**127050**	**76550**	

commodities like paddy, goatery and poultry .Though rearing poultry bird is an age old practice of the tribal community but due to lack of proper selection of breed, management practices, vaccination and feeding management they could not able to harness the expected income out of the poultry birds. Taking all these problems into consideration the KVK scientist introduced rearing of Vanaraja Poultry bird in their backyard.

The Mukunda Patra belongs to Schedule Caste community, 50years old farmer and his family consists of two sons with four daughters having 4 acres of land where he cultivate paddy, Cotton and some seasonal vegetables , where as his daughters are fond of poultry rearing as it is a very common practice in the tribal areas

KVK Intervention

Looking at the potential of growth of animal husbandry sector, KVK Scientist advised him to go for extensive backyard poultry rearing. KVK has distributed twenty Vanaraja chicks (21 days old)to each household of Pipalpada villagers. The animal scientist demonstrated about housing, layout of litter bed, feeding management, vaccination and disease management practices during rainy season of poultry birds. The farmers were briefly taught about proper care and vaccination schedule employed to Vanaraja poultry. They were also given with feed supplements, medicines, technical inputs and other accessory inputs for better growth and to enhance egg laying capacity of Vanaraja bird. At the same time he was motivated for dairy and back yard goat farming. He was also encouraged for employing value addition and tag a brand name for milk and milk by products. Goat popularly known as poor man's ATM was incorporated as a back bone to his farming system.

Impact :

The positive attitude of the farmer along with his family member towards poultry farming as a alternative employment opportunity could able to raise his income upto 10% of his total income. Backyard poultry farming (Vanaraja poultry) now has become one of the important substitute source of income. By seeing his success farmers are shifting towards poultry rearing. Farmers focus emphasis to new enterprise like dairy, goatery and poultry farming system. Income substantially increased with technological intervention in sustainable manner. Many farmers have been motivated by his success and some farmers with marginal land holdings have adopted poultry farming as a significant farming system along with agriculture.

CONCLUSION

Poor poultry rearing system in the concerned area must be improved by means of extensive awareness and training programs. Poultry keepers should be given hands on training on poultry vaccination; so that they can themselves implement poultry immunisation programs to prevent frequent disease outbreaks.

VEREMICOMPOST: Making Green India Clean India

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Abstract:

Vermicompost is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a heterogeneous mixture of decomposing vegetable or foodwaste, bedding materials, and vermicast.Vermicast (also called worm castings, worm humus or worm manure) is the end-product of the breakdown of organic matter by an earthworm. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic materials before vermicomposting. Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming.

Key Words: Waste Materials,Worms,Vermicompost,Nutrient,Organic Farming

Management of solid waste has become one of the biggest problems we are facing today. The rapid increase in the volume of waste is one aspect of the environmental crisis, accompanying recent global development (Rapid urbanization. encroachment of fertile area and booming population is leading to generation of massive amount of waste) India is agriculture based country where 70% people depends on agriculture for main inciome source.Now a days seviour use of chemical fertilizers increase not only the polution of air,water and soil but also decreases the quality of produce and soil health.To face such situations in our country organic cultivation concept should be pratised in every where. Vermicomposting can also be applied for treatment of sewage sludge. Furthermore, a variation of the process is vermifiltration (or vermidigestion) which is used to remove organic matter, pathogens and oxygen demand from wastewater or directly from blackwater of flush toilets. One of the species most often used for composting is the red wiggler or tiger worm (*Eisenia fetida* or *Eisenia andrei*); red earthworm or dilong (China)) is another breed of worm that can be used, but it does not adapt as well to the shallow compost bin as does *Eisenia fetida*. European nightcrawlers (*Eisenia hortensis*) may also be used.

VERMI-COMPOST

Composting can be done either in pits or concrete tanks or well rings or in wooden or plastic crates appropriate in a given situation. It is preferable to select a composting site under shade, in the upland or an elevated level, to prevent water stagnation in pits during rains. Vermicomposting is set up by first placing a basal layer of vermibed comprising broken bricks or pebbles (3-4 cms.) followed by a layer of coarse sand to a total thickness of 6-7 cms. To ensure proper drainage, a 15 cms moist layer of loamy soil follows. Into this soil 100 earthworms are inoculated. Small lumps of cattledung (fresh or dry) are then scattered over the soil and covered with a 10cm layer of hay. Water is sprayed till the entire set up is moist but not wet. Less water kills the worms and too much water chases them away. Watering the unit is continued and the unit is monitored for 30 days. The appearance of juvenile earthworms by this time is a healthy sign. Organic refuse is added from the 31st day as a spread on the bed. Addition of refuse can be done twice a week, watering to requirement. After a few applications, the refuse is turned over without disturbing the bed. The day enough refuse has been added into the unit, watering is continued and 45 days later the compost is ready for harvest. The organic refuse changes into a soft, spongy, sweet smelling, dark brown compost.

BREEDING

Worm populations double each month. In ideal conditions they can reproduce much faster than that: 1 lb of worms can increase to 1,000 lbs (one millionworms) in a year, but in working conditions 1 lb will produce a surplus of 35 lbs in a year, because hatchlings and capsules (cocoons or eggs) are usually lost when the vermicompost is harvested.Mature redworms make two or three capsules a week, each producing two or three hatchlings after about three weeks. The hatchlings are tiny white threads about half an inch long, but they grow fast, reaching sexual maturity in four to six weeks and making their own capsules. Three months later they're grandparents!

TEMPERATURE AND CLIMATE:

The most common worms used in composting systems, redworms (*Eisenia foetida, Eisenia andrei,* and *Lumbricus rubellus*) feed most rapidly at temperatures of 15–25 °C (59-77 °F). They can survive at 10 °C (50 °F). Temperatures above 30 °C (86 °F) may harm them. This temperature range means that indoor vermicomposting with redworms is possible in all but tropical climates. Other worms like Perionyx excavatus are suitable for warmer climates.

BENEFITS:

SOIL

- Improves soil aeration
- Enriches soil with micro-organisms (adding enzymes such as phosphatase and cellulase)
- Microbial activity in worm castings is 10 to 20 times higher than in the soil and organic matter that the worm ingests.
- Attracts deep-burrowing earthworms already present in the soil
- Improves water holding capacity.

PLANT GROWTH

- Enhances germination, plant growth, and crop yield
- Improves root growth and structure
- Enriches soil with micro-organisms.

ECONOMICS

- Biowastes conversion reduces waste flow to landfills
- Elimination of biowastes from the waste stream reduces contamination of other recyclables collected in a single bin (a common problem in communities practicing single-stream recycling)
- Creates low-skill jobs at local level
- Low capital investment and relatively simple technologies make vermicomposting practical for less-developed agricultural regions

ENVIRONMENTAL

- Helps to close the "metabolic gap" through recycling waste on-site
- Large systems often use temperature control and mechanized harvesting, however other equipment is relatively simple and does not wear out quickly.
- Production reduces greenhouse gas emissions such as methane and nitric oxide (produced in landfills or incinerators when not composted or through methane harvest).

CONCLUSION

Vermicompost is an excellent soil amendment and a biocontrol agent which make it the best organic fertilizer and more eco-friendly as compared to chemical fertilizers. Vermicompost is an ideal organic manure for better growth and yield of many plants. It can increase the production of crops and prevent them from harmful pests without polluting the environment. Application of vermicompost increased seed germination, stem height, number of leaves, leaf area, leaf dry weight, root length, root number, total yield, number of fruits/plant, chlorophyll content, pH of juice, TSS of juice, micro and macro nutrients, carbohydrate (%) and protein (%) content and improved the quality of the fruits and seeds. Vermicomposts use is one of important way for a sustainable agriculture discouraging the use of chemical fertilizers.

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A Horti based farming system model for food and nutritional security

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Abstract

Integrated farming system (or integrated agriculture) is a commonly and broadly used word to explain a more integrated approach to farming as compared to monoculture approaches. It refers to agricultural systems that integrate livestock and crop production or integrate fish and livestock and may sometimes be known as Integrated Biosystems. In this system an inter-related set of enterprises used so that the "waste" from one component becomes an input for another part of the system, which reduces cost and improves production and/or income. IFS works as a system of systems. IFS ensure that wastes from one form of agriculture become a resource for another form. Since it utilizes wastes as resources, we not only eliminate wastes but we also ensure overall increase in productivity for the whole agricultural systems. We avoid the environmental impacts caused by wastes from intensive activities such as pig farming.

Key words *: IFS,Pond,Crops,Climate,Soil*

INTRODUCTION

The development of high yielding varieties of crops and breeds of livestock, and the breeding of strains that possess a broad spectrum of resistance to pests, disease and to diverse soil stress, coupled with good management, had helped to raise the crop and livestock productivity to high levels. The large-scale cultivation of improved crop varieties together with efforts to maintain good soil fertility and water management helps to increase production through higher yield per hectare. Land is a shrinking resource for agriculture. A rational land use plan is needed to increase agricultural production by achieving higher yields per ha through intercropping, multiple cropping and increasing cropping intensity. With the increasing pressure of population on agriculture land, it is now increasingly being felt at the international level, that for meeting the food requirements of the increasing population, more land will have to be brought under cultivation. But India is fortunate to have good potential for increasing productivity, as the productivity in our farming system is far behind its actual potential. The country will have to accord high priority to reducing the gap between realiable and actual yields in farmers' fields by identifying and removing the constraints responsible for the yield gaps. After

independence, our agricultural policies were influenced greatly by the needs of big landlords. As a result, the needs of the large majority of small peasants were neglected. That is why even after 67 years of independence, three-fourth of our agricultural land remains uneconomical. Because of this lacuna in our agricultural policies, small farmers remain below the poverty line, and our country has not prospered agriculturally. More than 80% of Indian farmers own two and half acre or less land. Their share of cultivated land is about a third of the total available agricultural land in the country. Over time, due to high population growth that caused a division of land holdings, and a very slow growth rate of the rural economy, the pressure on land has been steadily increasing and the number of small and marginal farmers has been growing. These farmers can play a leading role in the development of the country by contributing to the nation's capital formation, if their uneconomic holdings are converted into economic ones. However, with the traditional cropping system, small and marginal farmers are finding it difficult to produce adequate food to feed their families. The only way to convert these holdings into profit-making ones is through the intensive use of land through diversification of crops.

All over the world, farmers work hard but do not make money, especially small farmers because there is very little left after they pay for all inputs (seeds, livestock breeds, fertilizers, pesticides, energy, feed, labour, etc.). The emergence of Integrated Farming Systems (IFS) based on horticulture farming has enabled us to develop a framework for an alternative development model to improve the feasibility of small sized farming operations in relation to larger ones.

GOALS OF IFS

The Goals of this Integrated Farming Systems Manual (IFS) are to:

- provide a steady and stable income rejuvenation/amelioration of the system's productivity and
- achieve agro-ecological equilibrium through the reduction in the build-up of pests and diseases, through natural cropping system management and the reduction in the use of chemicals (in-organic fertilizers and pesticides).

Scope of farming system

Farming enterprises include crop, livestock, poultry, fish, tree crops, plantation crops, etc. A combination of one or more enterprises with cropping, when carefully chosen, planned and executed, gives greater dividends than a single enterprise, especially for small and marginal farmers. Farm as a unit is to be considered and planned for effective integration of the enterprises to be combined with crop production activity. Integration of farm enterprises to be combined on many factors such as:

1. Soil and climatic features of the selected area.
2. Availability of resources, land, labour and capital.
3. Present level of utilization of resources.
4. Economics of proposed integrated farming system.
5. Managerial skill of the farmer

The practitioner can use IFS to

- Improve productivity
- Regulate nutrient and material flows
- Increase on-farm biodiversity
- Limit disease
- Reduce the smell of some livestock operations

The following situations are ideal for the introduction of IFS:

- The farmer wishes to improve the soil quality
- The farm household is struggling to buy food or below the poverty line
- Water is stored on-farm in ponds or river-charged overflow areas
- Fertilizers are expensive or the recommended blend is unavailable
- Soil salinity has increased as a result of inorganic fertilizer use
- The farmer is seeking to maximize profits on existing holding
- The farm is being eroded by wind or water
- The farmer is looking to reduce chemical control methods
- The farmer wants to reduce pollution or waste disposal costs

Advantages of IFS

- It improves space utilization and increase productivity per unit area
- It provides diversified products
- Improves soil fertility and soil physical structure from appropriate crop rotation and using cover crop and organic compost
- Reduce weeds, insect pests and diseases from appropriate crop rotation
- Utilization of crop residues and livestock wastes
- Less reliance to outside inputs – fertilizers, agrochemicals, feeds, energy, etc
- Higher net returns to land and labour resources of the farming family

OBJECTIVE

The main objective of pond based farming system is to generate maximum income and employment by combining different enterprises namely field crop, multi-storeyed cropping, pomology, olericulture, floriculture, fishery, duckery, poultry, mushrooms, apiary, biogas, agro-forestry and commercial nursery by recycling product and by products. This farm pond based model is intended for farmers of the coastal districts having two ha of land with a pond. Shade loving crop plants such as ginger, turmeric and pine apple were planted under the coconut trees. One poultry unit had been installed at one of the corners of the pond with the idea that the droppings of the birds would directly fall into the water to help the growth of the planktons. The model also had a duckery unit. A biogas plant was installed to meet the energy need of the family. Slurry generated at the plant was used as manure for crops and a part of it was diverted to fish pond to encourage the growth of the plankton. Every early morning raw ungcollected from the bullock shed of the central farm was fed to the biogas plant. Brinjal, okra, cowpea and maize were grown in Kharif while tomato. Watermelon, cucumber, bitter gourd, and bottle gourd etc , were grown in the Rabi season. Fodder crop was

grown to supply greens to the dairy. Banana, mango, ber, lemon and yam had been planted around the pond to utilize all the available space.

POND PREPARATION

Remove aquatic weeds. Compost and use them later as manure for the pond. Remove all the existing fish stock from the pond by repeated netting and draining the pond water. If it is not possible to drain the pond, kill the fishes by adding to the water 15 kg bleaching powder and 15 kg of urea (for 1000 sq m pond). Bleaching powder may be applied one day after urea application. Application of 250 kg Mahua oil cake (Basia latifolla) can also be done for the eradication of fish. Mix it thoroughly with the pond water and net all the fishes.

Manure the pond with the compost (made out of the aquatic weeds). Apply 500 kg basally; the rest (500 kg) may be applied in two equal instalments at 4 months interval.

Stock the pond with fingerlings 7 days after poisoning as the toxicity of bleaching powder lasts for about one week. The recommended rates (at stocking density of 600/1000 sq m) are:

Catla	240	Catla	180	Catla	90
Rohu	180	Rohu	180	Rohu	120
Mrigal	180	Mrigal	120	Mrigal	90
		Common carp	120	Silver carp	90
				Grass carp	90
				Common carp	120

Some alterations can be made on the stocking density and species ratio depending upon the pond conditions and availability of fish seed.

Table No1: Calendar of activities for horticulture farming system

August -	Pond preparation Dike preparation and planting of fruits and vegetables
September-	Stocking of the fish, Application of inorganic fertilizers to the crops
October -	Pest control if necessary
November -	Harvesting of vegetable, Inorganic fertilizer application
December -	Harvesting of vegetables
January -	Harvesting of vegetables Harvesting of papaya
February -	Preparation of dike for second crop of vegetables Harvesting of papaya Plantation of second crop of veg.
March -	Partial harvesting of fish Harvesting of papaya & banana
April -	Harvesting of papaya & banana
May -	Harvesting of vegetable (P & B)
June -	Harvesting of vegetable (P & B)
July -	Final harvesting of fish Harvesting of vegetable papaya and banana (P & B)

HARVESTING

The fish which attain marketable size should be harvested and the rest allowed to grow further. Final harvesting may be done 10-12 months after stocking.

CROP FARMING

The dikes are strengthened, terraced, prepared and fertilized by application of pond silt

Bananas, papayas, pumpkins, gourds, spinach, Brinjals, tomatoes, cucumbers and leafy vegetables are grown on the

dikes. Inorganic fertilizer is also applied to the plants in addition to pond silt @10 kg/year divided into installments.

Water the crops with manure pond water. Planting of papaya is done in June/July and banana in October/November and harvesting starts after 6 and 8 months following planting, respectively. A portion of the harvested fruits is consumed by the farmer and the rest are sold in the market.

Fruit Plants	Vegetable Plants
Papaya Banana Coconut	Brinjal, Cabbage, Cauliflower, Tomato Cucumber, Pumpkin, Ashgourd, Bottle gourd Radish, Beans, Cowpea, Ladies fingers Colocasia and other Leafy vegetables

The vegetable crops are grown and harvested twice in a year—once during August/September and the second time in March/April. After meeting the requirements of the farm family, the vegetables are sold. The list of vegetables and horticultural crops grown on the pond embankments is given below.

CONCLUSION

Integrated Farming System approach not only fulfills the household needs but enrich diet of human being and animals both for nutritional security. Further, diversified nature of the model provides employment opportunity for unemployed rural youth. Economic and livelihood analysis of the system revealed that beside household food, feed, fodder and fuel security, the system generates a sizable amount of savings which will assist to meet other liabilities of the family including education, health and social obligations and overall improvement in livelihood of small farm holders.

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Significance of colostrum feeding to calves and immune-stimulation

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Colostrum (or "beestings") is the thick, creamy and yellow secretion produced by the mammary gland instantly after calving to 4-5 days. It is richer source of immunoglobulin's, nutrients and biologically active substances. Colostrum provides passive immunization of the newborn calves (Ig, humoral and cellular), content antibacterial factors which give protection against infections after birth and also contributing to the development of gastrointestinal tract. Colostrums have laxative effects and helps to removal of meconium from the intestine. The average concentration of antibodies in colostrum is about 6% but ranges from 2 to 23%.

COMPOSITION OF COLOSTRUMS

The composition of colostrum is highly variable due to a number of factors, individuality, breed, parity, pre-partum nutrition, dry period length and time of post-partum (Table 1). Colostrum contains more protein, peptides, non-protein nitrogen, ash, fat, vitamins and minerals, hormone growth factors, cytokines, nucleotides and less lactose as compared to milk. Colostrum content very high concentration of immunoglobulin G (IgG), which provides passive immunity to calves through absorbing in gut immediately after parturition. Newborn calf receives an adequate amount of colostrum and immunoglobulins of the gut and their absorption decrease rapidly over the first 24 h after parturition. Colostrum stimulates the development and function of the gastrointestinal tract and influences metabolism, endocrine systems and the nutritional state of neonatal calves. Normal milk contains 12% solids, while colostrum content 22% these difference is associated to the concentration of immunoglobulin proteins. It is richer in casein, fat, protein, and vitamins A, B_{12}, D, and E, although lesser in terms of lactose. It helps to prevent the digestion of the immunoglobulins in the intestine with trypsin inhibitors. Transferrin and lactoferrin in colostrum play a vital role in controlling diarrhoea by binding iron and limiting the growth of some bacteria. Colostrum fulfils these responsibilities through the cellular (polymorph nuclear leukocytes, macrophages, lymphocytes, and natural killer cells) and humoral

(lactoferrin, the lactoperoxidase thiocyanate hydrogen peroxide system, lysozymes, complements, and immunoglobulins) factors that it contains. In addition, the colostrum of ruminants and ewes contains insulin-like growth factor I (IGF-1), insulin (INS), growth hormone (GH), thyroxine (T4), tri iodothyronine (T3), and prolactin (PRL).

Table 1. Composition of colostrums and milk

Ingredients	Colostrum	Transition Milk	Milk
Total Solids (T.S.) %	23.9	17.9	12.5
Fat %	6.7	5.4	4.0
Protein %	14.0	8.4	3.1
Antibody %	6.0	0.2	0.09
Lactose	2.7	3.9	5.0
Minerals	1.1	1.0	0.7
IgG (mg/ml)	48	25	0.6
Vitamin A (µg/dl)	295	190	34

Development of the neonatal immune system

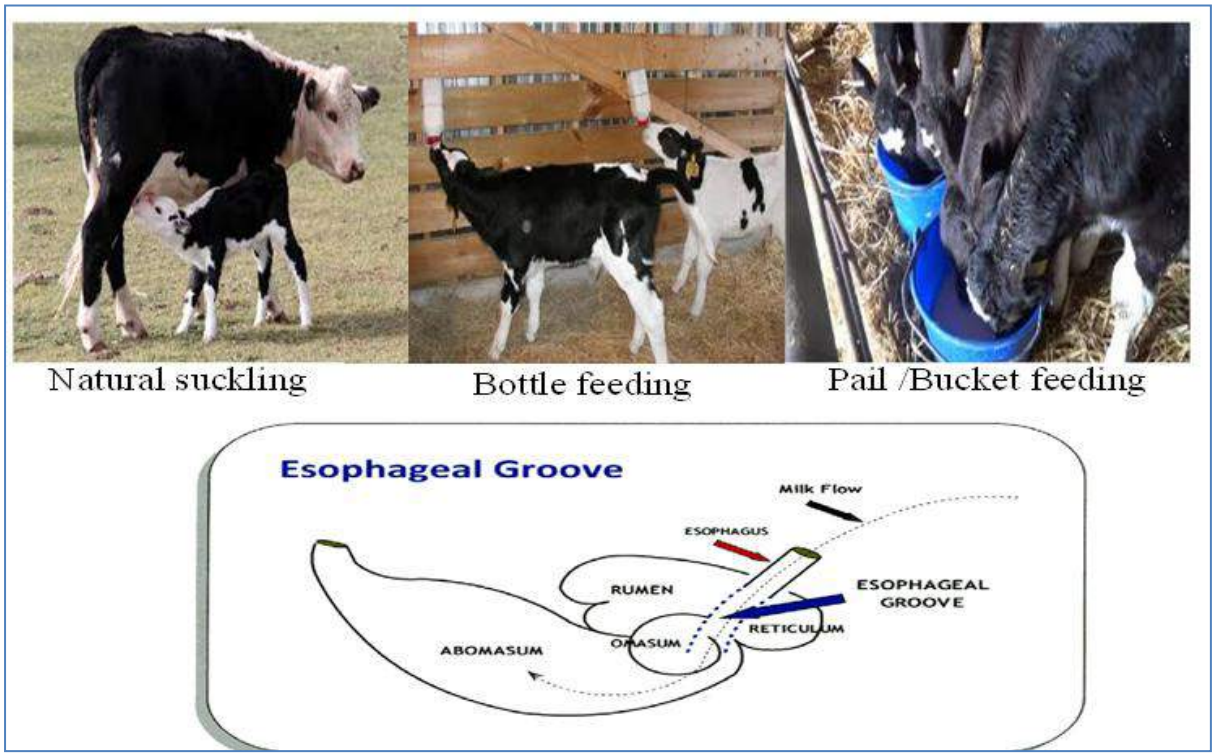
Ruminants' epitheliochorial placenta is impermeable for antibodies and this situation causes newborns to be devoid of immunoglobulins namely, agammaglobulinaemia, or with a very small amount of immunoglobulin, namely hypogammaglobulinaemia. In newborn ruminants are need of the immunoglobulins, absorb through colostrums provide passive immunity and their development of immune system. However, the transition of immunoglobulins obtained from colostrum takes place within a limited period of time. The small intestine of lambs begins to lose the ability to absorb maternal antibodies within 24–48 h after birth. The end of the intestinal wall permeability to macromolecules in newborn animals is called "intestinal closure".

GROWTH FACTORS IN COW COLOSTRUM

Many growth factors present in the bovine colostrum. The physiological importance of the following main growth factors in cow colostrum is studied: IGF-1, IGF-2; colostric basic growth factor, prolin rich polypeptide etc. Some of them are absorbed in very low amounts and exert a local stimulating effect upon the growth and development of the gastro-intestinal tract of newborn calves, whereas others, together with endogenous growth factors, are essential for the growth and development of the other organs. The highest proportion of cow colostrum growth factors is that of insulin-like growth factors (IGFs). IGFs could originate from blood or be synthesized in the udder.

METHOD OF COLOSTRUM FEEDING

The amount of colostrums ingested by a calf through suckling, using a bottle or a pail equipped with nipple. The calves feeding colostrums from an open pail are not a good method of feeding because it reflex oesophageal abomasal groove and did not have closer of esophageal groove that leads to diarrhea. In natural suckling, least chance of infection but amount of intake is not control may cause calf scour and diarrhoea. Bottle feeding is better than open pail feeding in term colostrums intake, growth and health of calves. In bottle feeding colostrums or milk directly reaches to abomasums (bypass rumen)



and maternal antibody available to small intestine to get absorbed by pinnocytosis.

AMOUNT AND TIME OF COLOSTRUM FEEDING

Colostrums have a laxative effect and stimulate the development of digestive function. The amount and time of colostrums feeding is very important for calf rearng. Generally a calf should receive colostrum 5 to 8% of its body weight within 12 hours of life and next feeding 10% of its body weight for 2 to 3 days. Timing of colostrums feeding to calves is essential for calf ruminal development and health. There are about 66 % of the immunoglobulins present in colostrum absorbed within six hours after birth, but after 36 hours able to absorb only about 7 % of immunoglobulins. In case of insufficient antibody rich colostrums provision, there will be a weak immune response against infection and consequently increased risk to poor diseases and mortality rate.

FACTOR AFFECTING COLOSTRUM QUALITY

Colostrum related factors: Method of feeding: Leaving calves to nurse from their mothers can cause extreme problems with colostrum and immunoglobulin consumption. Approximately 25-40% of calves that nurse from the dam do not consume an adequate amount of high quality colostrum because calves tend to drink small quantities after birth. This inadequate consumption allows bacteria to enter and multiply in the intestine, causing mortality that may lead to death. Many times, calves do not want to consume the recommended amount of colostrum right after birth because they do not have a strong drive to nurse. When this occurs, esophageal feeders can be used to ensure calves receive an appropriate amount of quality colostrum. It is recommended that calves be removed from their dam no longer than

two hours after parturition when fed via bottle or esophageal feeder. Feeding calves with the use of an esophageal feeder or 'tube' doesn't come without risk. Inserting the tube can cause damage to the oral tract of the calf so it should be inserted and taken out very carefully.

Cleanliness: Cleanliness is the very important factor that refers to the absence of bacteria in colostrums. Unfortunately, in commercial farms have high levels of bacteria present in colostrums more than 100,000 cfu/mL. Bacteria present in colostrum have a negative impact on IgG absorption by the calf because they may bind IgG in the calf's small intestine or they may directly block the uptake of IgG by the intestinal cells. Bacteria in colostrum may also be pathogenic and cause diseases such as diarrhoea. There are several management practices that should be followed to minimise bacterial contamination of colostrums. An effective method for reducing bacterial contamination of colostrum is pasteurisation. Typical milk pasteurisation temperatures are too high for pasteurising colostrum; the IgG is partially destroyed by high temperatures and the colostrum tends to thicken. The recommended practice is to pasteurise colostrum at 60^{o}C for 60 minutes. Pasteurised colostrum stored in a clean, covered container in the refrigerator has a shelf life of 8-10 days.

Cow related factors: There are quite a few cow factors that influence the colostrum. Not surprising, as the colostrum comes from the cow. Firstly, the health of the cow is key. Pathogen exposure is crucial in regards to dam health and colostrum quality. Cows that have been exposed to higher amounts of pathogens are more likely to have higher immunoglobulin levels. Pathogen exposure and age are highly correlated due to the fact that older cows tend to be exposed to a greater number of pathogens. However, there is also a risk in feeding calves raw maternal colostrum because pathogen exposure occurring before calves have developed immunity can affect mortality and morbidity. *Mycobacterium avium spp, Paratuberculosis, Mycoplasma spp, Escherichia coli,* and *Salmonella spp* are all infectious diseases that can cause scours and septicemia in calves by being shed from the udder or by mishandling and storing raw colostrums**.**

Vaccination of the cow: Several vaccines are commercially available for prepartum immunisation of cows against rotavirus and corona virus infections in newborn calves. The pregnant cow is vaccinated starting from 6 weeks before parturition to 2 weeks before the calf is born to stimulate the production of specific types of Ig. These are then transferred to the calf via colostrum to provide an effective means of preventing many diseases which calves are most susceptible to early in their life. The above approaches are more biologically effective for calves raised on the same farm and exposed to the same infectious agents as their dams. These calves would usually have good protection against diseases prevailing on that farm through which the relevant Ig types have been developed in the dam's serum and colostrum.

Parity: Colostral quality continues to increase with parity after the second calving and older cows generally have the best quality colostrum. However, some heifers produce very good quality

colostrum and producers should not automatically discard heifer colostrum but should test and keep high quality colostrum from a cow of any parity.

Length of the dry period: Shortening the dry period to 28-40 days does not seem to have a substantial impact on colostrum quality in multiparous cows, although the volume of colostrum produced may be less in cows with a dry period <40 days. cows seem to need at least a 3-4 week dry period to produce good quality colostrum, and when dry period is very short (<21 days) or there is no dry period, colostrum will often be of poor quality.

Cow nutrition in the dry period

The energy level of diets fed to dry cows on immunity status and performance of the calves born to these cows. The cows were fed 7 weeks of the dry period (far-off period) and 1 week later (close-up period) on diets containing an energy value of either 0.69 or 0.61 UFL/Kg DM. With a high energy diet, calves had better immunity status attributed to the maternal colostrums, which was better synthesised with the higher energy supply of the dam during the far-off period. As a result, the calves had greater levels of serum Ig and IGF-1 and better gains during their first few weeks of life. The increased level of serum IGF-1 may also be an indication of better health and lower mortality in the calves born to cows on a high-energy diet during the dry period.

STORAGE OF COLOSTRUM

For long-term storage, colostrums can be preserved by freezing without any loss of its immune value (destruction of antibodies). This practice is a convenient way to ensure that good quality colostrums are always available. Colostrum from mature cows that were born and raised on the farm should be frozen in packages of 1.5 to 2 kg, the amount needed for a single feeding. Surplus colostrum within 2 hours of collection can be refrigerated to control bacterial growth. Refrigeration at 4˚C in plastic container maintains the viability of antibodies and other components of colostrum for up to 7 days. For long term preservation, the best method is storing colostrum in deep freezer for up to one year with little nutrient loss. Thawing of colostrum slowly in warm water (39 to 40˚C). Rapid thaw can damage and reduce the efficacy of colostral antibodies or it can also be thawed in a microwave set on low power for short periods of time and constantly pour off thawed portions. This is some advantage of pool colostrums feeding from different cows as it minimize the effect of low immunoglobulin in colostrum and increase the volume available to calves and has a negative effect on the acquisition of immunity. It is best to have colostrum from one's own herd, since using colostrum from other herds raises biosecurity issues as well as differences in antibody concentrations.

IMMUNOSTIMULATION

The only defence mechanism against the environmental factors of a neonatal ruminant is the antibodies obtained from colostrum. The poor nutrition of the dam, immune system suppression, and stress factors may lead to inadequate colostral immunoglobulin titres. Besides the improvement of nutritional and stress conditions, the stimulation of the immune system by exogenous methods may increase colostral immunoglobulin titres.

The regulation of the immune system with some agents given to an organism exogenously is defined as "immunostimulation" and the agents used in this process are called immunostimulants. Immunostimulants are analysed in 2 main groups as chemical and biological according to their origin. Both immunostimulant classes may be used for the treatment of and protection against various infections and may also be used as adjuvants that cause stronger immune responses in organisms against the vaccines administered. However, the actual expected effect of an immunostimulant is to decrease the morbidity and mortality rates and increase weight gain. Activation of macrophages has been performed primarily in order for the preparation that was given to have an immunostimulant effect on the organism. For the preparation given to the organism to have an effect, inflammation is the first response of the body against pathogens. First, the polymorphonuclear cells (granulocytes) migrate to the region and then invasion of macrophages takes place. Macrophage activation is then stimulated either as a result of direct interaction with antigens or by way of bacterial endotoxins. When these immunostimulants are captured and digested by macrophages, they stimulate the macrophages to synthesise cytokines such as interleukin-1 (IL-1), tumour necrosis factor (TNF), and interleukin-6 (IL-6). After the release of these cytokines, lymphocytes are activated and lymphokines such as interleukin-2 (IL-2) and interferon-γ (IFN-γ) are released. At the end of all of these stages, resistance to viral infection, natural killer cell (NKC) activity, production of antibodies, inflammation reactions, and the level of wound healing increase.

CONCLUSION

Colostrum feeding is very important for health and survival of newborn calves. The composition of colostrum differs markedly from milk, reflecting a difference in the biological function of the two secretions. The concentration of many nutrients (proteins, vitamins, minerals etc.) and biologically active substances (Ig, enzymes, hormones, growth factors etc.) is many times higher in colostrum than in milk. The cow colostrum is the richest in IGF-1 and IGF-2, especially in the first portions. The factor affect Immunoglobulin absorption is amount, timing and method of colostrums feeding. In colostrum contain tremendous amount of antibodies and nutrient, growth factor, immune factor and nutritional components.

Most deadly infectious diseases of horses

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Infectious horse diseases are those that horses can get from each other, or via a transmitter such as a mosquito or tick, which may transmit the disease from horse to horse. Knowledge is key to prevention. Here are some of the most common horse diseases:

Potomac Horse Fever

This disease is most often seen in spring, summer, and early fall and is associated with pastures bordering water sources such as creeks or rivers. PHF is an acute enterocolitis syndrome producing mild colic, fever, and diarrhea in horses of all ages, as well as abortion in pregnant mares.

The bacterium responsible for the disease, *Neorickettsia risticii*, has been identified in flatworms that develop in aquatic snails (who knew!). When the water warms up, infected immature flatworms are released from the snail into the aquatic environment. These immature flatworms can be ingested by horses drinking the water, but more commonly they are picked up by aquatic insects. Infected insects (such as mayflies) will hatch in mass and might carry the organism to horses to ingest as they graze (thehorse.com).

Signs Of PHF

- loss of appetite
- fever
- depression

- decreased intestinal sounds
- diarrhea
- mild colic

Affected horses might also develop signs of laminitis. PHF can be mild to life-threatening, so if you think your horse is showing signs of PHF you should contact your veterinarian immediately. PHF can be diagnosed by laboratory identification of the organism in a blood or manure sample from the horse by polymerase chain reaction (PCR). If caught early, it can be treated successfully with oxytetracycline.

Prevention

Several vaccines are commercially available. These might not completely prevent illness, but they may reduce its severity if the horse is exposed to the organism. Consult with your veterinarian to decide the best course of action.

Equine Herpesvirus (EHV)/Rhinopneumonitis

With recent outbreaks of EHV in 2015, most horse owners are somewhat aware of the dangers of this highly contageious virus. EHV is characterized by respiratory infections, paralysis, abortions, inflammation of the spinal cord, and occasionally death in young horses. EHV is extremely contagious, spreading through nasal secretions, contact with infected horses, and contaminated feed and water utensils. Type 1 (EHV1) and Type 4 (EHV4) are the most clinically important.

Signs of EHV:

•Nasal discharge
• In coordination
• Hind limb weakness
• Loss of tail tone
• Lethargy
• Urine dribbling
• Head tilt
• Leaning against a fence or wall to maintain balance
• Inability to rise

If you think your horse may have been exposed to the virus (while traveling or at a show) start isolation procedures immediately to prevent it from spreading through your whole herd. Check temps of all horse on your farm several times a day, if fever is detected check for EVH-1 and consult with your equine veterinarian for further guidance.

Prevention

There are two things you can do to help prevent an EVH outbreak on your farm:

1. **Vaccinate:** While there are several vaccines available, unfortunately there is no licensed vaccine that has a claim for protection against the neurological strain of the virus (EHM). Consult with your veterinarian for further guidance.
2. **Implement Biosecurity Practices** on your farm. This includes quarantining any new animals on the farm, or those that have traveled recently before introducing them to your herd, and washing instruments such as

grooming supplies between use on each animal.

Equine Influenza (Flu)

Equine influenza, is one of the most common infectious diseases of the respiratory tract of horses. This is a highly contagious virus that can be contracted through direct contact with an infected horse or indirectly by contaminated environment. Infected horses incubate the disease for 1-3 days before displaying symptoms, which is why outbreaks can spread so rapidly. Unfortunately influenza is endemic in the US, which means it circulates continuously in the equine population.

Signs of Equine Influenza

- Fever
- A harsh, dry cough of sudden onset that persists for 2-3 weeks or more
- Clear nasal discharge progressing to thick, green-yellow discharge
- Lethargy/depression
- Loss of appetite

Prevention:

Implementing good biosecurity practices including quarantining of newly arrived or traveling horses for at least 14 days. There are also vaccinations available that can be used before exposure. Consult with your veterinarian regarding vaccinating your horse.

Streptococcus equi (Strangles)

Strangles is an infectious horse disease characterized by abscessation of the lymphoid tissue of the upper respiratory tract. *Streptococcus equi equi*, is the bacterium which causes the disease, and is transmitted by direct contact with infected horses or sub-clinical shedders, or indirectly by contact with: water

troughs, hoses, feed bunks, pastures, stalls, trailers, tack, grooming equipment, nose wipe cloths or sponges, attendants' hands and clothing, or insects contaminated with nasal discharge or pus draining from lymph nodes of infected horses.

Signs of Strangles:

- Fever (103°–106°F)
- Nasal discharge
- Depression
- Difficulty swallowing
- Respiratory noise
- Extended head and neck
- Swollen lymph nodes

In some outbreaks and in a small percentage of cases, these abscesses spread to other parts of the body (a condition known as 'bastard' strangles) which is nearly always fatal. As with the other diseases above, contact your vet if you think your horse is showing signs of

strangles for treatment. Due to being so contagious, affected horses should be separated, and cared for by separate caretakers wearing protective clothing.

Prevention:

Vaccination is often the best preventive measure for Strangles. Contact your veterinarian for guidance.

Tetanus (Lockjaw)

Tetanus is caused by the bacterium *Clostridium tetanii* which can be found in soil and manure. This bacteria is found in just about every environment, and can survive for long periods of time. Wound contamination is generally what leads to infection; a clean wound is not as likely to result in tetanus.The tetanus bacteria do not need oxygen and multiply rapidly in the damaged tissues. They produce a toxin (tetanus toxin) and it is this neurotoxin that causes the classical signs of tetanus.

Tetanus proves deadly in 50-75% of cases.

Signs of Tetanus:

Muscular stiffness and spasms

- Difficulty moving and eating
- Tail often held straight out
- Development of an anxious expression due to facial spasms
- Sweating
- In advanced cases the horse will collapse with spasms, convulsions and death from respiratory failure

Prevention:

Tetanus is a preventable disease, and vaccination is key to prevention. Good first aid practices are also important which include keeping wounds clean and ensuring your turn out areas are safe, clean, and clear of dangerous items that could cause injury. Consult with your veterinarian to ensure you are taking the necessary prevention measures on your farm.

Pseudo Ripened Fruits:
Are they Safe to Eat?

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Ripening is a process in fruits that causes them to become more edible. In general, a fruit becomes sweeter, less green, and softer as it ripens. However the acidity as well as sweetness rises during ripening, but the fruit still tastes sweeter regardless. An organic compound involved with ripening is ethylene, a gas created by plants from the amino acid methionine. Ethylene increases the intracellular levels of certain enzymes in fruit and fresh-cut products, which include: amylase, which hydrolyzes starch to produce amylase, which hydrolyzes starch to produce simple sugars, and pectinase, which hydrolyzes pectin, a substance that keeps fruit hard. Other enzymes break down the green pigment chlorophyll, which is replaced by blue, yellow, or red pigment. Mango fruits ripen unevenly on the tree and natural ripening can be very slow and unpredictable. Hence, to overcome these problems certain chemicals are used to ripen the fruits artificially. Fruits are briefly exposed to ethylene or similar gases like acetylene to initiate the ripening process. Ethylene is known to be a plant hormone that triggers fruit

ripening. It has been reported that if ethylene is applied exogenously it helps fruit ripening. Ethylene - treatment is usually given at the packing house or at the point of di stribution. Ethephon is known as one of the most common ethylene-generating chemical and post-harvest treatments. Ethephon accelerates ripening and improves the peel color of the mangoes. Though ethylene promotes the ripening process & improves colour development of the fruits, it has some disadvantages in post-harvest shelf life & can be harmful to product quality. Furthermore is an explosive and very expensive. Use of ethylene for ripening of the fruit is a common practice in different countries but due to high cost and scarcity in terms of its availability, many

developing countries like Bangladesh, India & Pakistan use low-cost calcium carbide to ripen fruit. Usually calcium carbide is imported from China, Taiwan and South Africa. Acetylene gas is generated from calcium carbide, which initiates the ripening process in a similar manner to ethylene. This practice is commercially used in Brazil and Senegal. Fruits ripened with calcium carbide are soft and have good peel color development but poor in flavor. A number of countries use calcium carbide to ripen a wide range of fruits. Ethephon 39% (10 ml) and sodium hydroxide (2 gm), kept in a bucket close to mangoes heaped in an airtight chamber would release ethylene gas, which naturally facilitates the ripening of fruits without any harmful effect.

HEALTH HAZARDS ASSOCIATED WITH CARBIDE

Though calcium carbide is used methodically in many countries including India, in our country it is being used openly, commonly & in an inappropriate way for ripening fruits. A very strong reactive chemical, calcium carbide has carcinogenic properties. Acetylene generated from carbide is flammable and explosive even in a low concentration as compared to ethylene. Acetylene gas is an analogue of ethylene and quickens the ripening process. Sometimes only the skin color is changed while the fruit remains unripe and raw. When a high dose of carbide is used on a raw fruit for ripening purposes it results in poor flavor of the fruit and possibly toxic. It is also considered as extremely hazardous as it may contain traces of arsenic and phosphorus hydride. Early symptoms of arsenic and phosphorus poisoning include vomiting, diarrhea with or without blood, burning sensation of the chest and abdomen, thirst, weakness and difficulty in swallowing and speech. Other effects include numbness in the legs and hands, cold and damp skin and low blood pressure and in cases it can become fatal if not treated in time. Acetylene gas had an unpleasant odor and produced a noticeable flavor in the treated fruits. It is not only toxic to the fruits but it may be harmful to those who handle it. It affects the neurological system resulting in headache, dizziness, mood disturbances. sleepiness, mental confusion and seizures on a short-term basis, while in the long term it can cause memory loss and cerebra

l edema. Use of ethylene and (methyl jasmonate) MJ for fruit ripening purposes is not harmful for human consumption but these compounds are quite expensive hence developing countries use low cost calcium carbide, which is harm ful and has

many disadvantages compared to ethylene. In developed countries fruits are ripened commercially in an artificial chamber having no health hazards. But in our country traders are using obsolete chemical, carbide being propelled by the quick-buck syndrome. Thus we are in risk of short-term as well as long-term health effects simply by eating fruits.

1. Ethephon 39%, which is available in the market in the commercial name of ethrel, is being used as plant growth regulator in mango, pineapple, coffee, tomato, cucumber, groundnut and rubber. As this cost-effective method retains the actual colour and taste of the fruit and increases its shelf-life, this harmless method to ripen fruits could be a hit and a boon to the traders. It is essential to control the delivery system of acetylene from calcium carbide, which must be safe and applicable to the wide range of users.
2. Government, Concerned health authorities and law enforcing agencies should pay attention to this illegal practice of using carbide openly, which is occurring in many parts of Bangladesh.
3. It is important to develop new and better technique of application, which prevents direct contact of the substance with the fruits.
4. New compound, which are environmentally safe and not harmful for human health, must be discovered and tested.

Commercial ripening is an essential part of business as ripe fruits are not suitable to carry & distribute, as they get rotten. So fruit traders pick unripe fruits & use certain methods to increase the shelf life of them. Valid and acceptable methods of using chemical are desirable in this regard. Anything breach of that might be hazardous for our health.

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Cell culture: An overview

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What is Cell Culture?

Cell culture refers to the removal of cells from an animal or plant and their subsequent growth in a favorable artificial environment. The cells may be removed from the tissue directly and disaggregated by enzymatic or mechanical means before cultivation, or they may be derived from a cell line or cell strain that has already been established.

TYPES OF CELL CULTURE

Primary Culture

Primary culture refers to the stage of the culture after the cells are isolated from the tissue and proliferated under the appropriate conditions until they occupy all of the available substrate. At this stage, the cells have to be **sub cultured** (i.e., passaged) by transferring them to a new vessel with fresh growth medium to provide more room for continued growth..Primary cell culture could be of two types depending upon kind of cells in culture-Adherent cell and Suspension cells**.**

Adherent cell - cells shown to require attachment for growth are said to be anchorage dependent cells.

Suspension cells

cells which do not require attachment for growth or don't attach to the surface of the culture vessels.

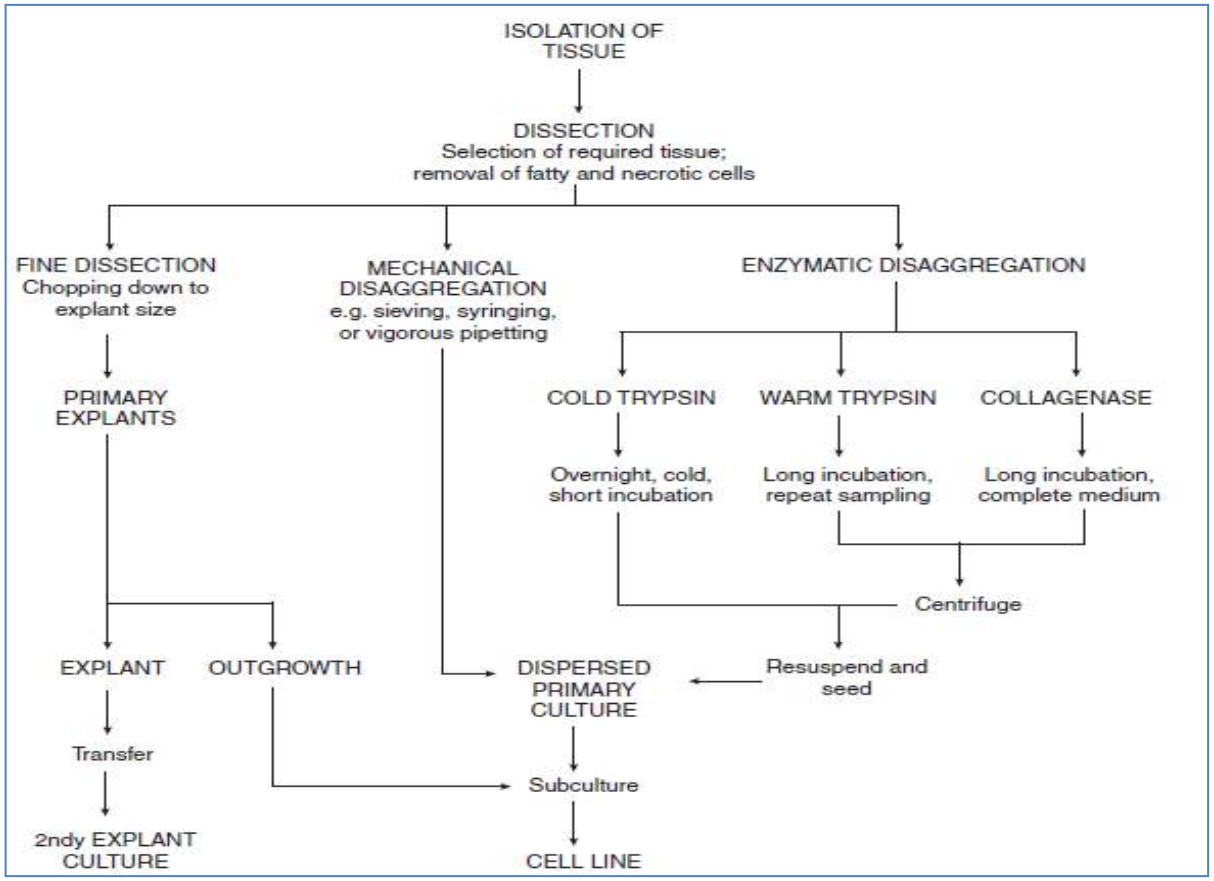
Secondary culture

When a primary culture is subcultured it becomes secondary culture or cell line.subculture (passage) refers to the transfer of cells from one culture vessel to another culture vessels.

Cell Line :After the first subculture, the primary culture becomes known as a cell line or sub-clone. Cell lines derived from primary cultures have a limited life span (i.e., they are finite)

Finite vs Continuous Cell Line

Normal cells usually divide only a limited number of times before losing their ability to proliferate, which is a genetically determined event known as **senescence**; these cell lines are known as



finite. However, some cell lines become immortal through a process called **transformation**, which can occur spontaneously or can be chemically or virally induced. When a finite cell line undergoes transformation and acquires the ability to divide indefinitely, it becomes a **continuous cell line.**

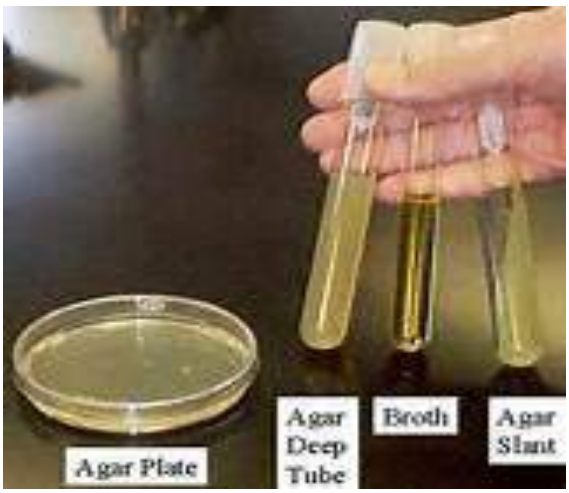
Culture Conditions

Culture conditions vary widely for each cell type, but the artificial environment in which the cells are cultured invariably consists of a suitable vessel containing the following:

- a substrate or medium that supplies the essential nutrients (amino acids, carbohydrates, vitamins, minerals)
- growth factors
- hormones
- gases (O_2, CO_2)
- a regulated physico-chemical environment (pH, osmotic pressure, temperature)

Types of Cell Culture Media

Animal cells can be cultured either using



a completely natural medium or an artificial/synthetic medium along with some natural products.

Table 1. Types of natural and artificial media.

	Media Type	Examples	Uses
Natural media	Biological Fluids	plasma, serum, lymph, human placental cord serum, amniotic fluid	
	Tissue Extracts	Extract of liver, spleen, tumors, leucocytes and bone marrow, extract of bovine embryo and chick embryo	
	Clots	coagulants or plasma clots	
Artificial media	Balanced salt solutions	PBS, DPBS, HBSS, EBSS	Form the basis of complex media
	Basal media	MEM DMEM	Primary and diploid culture
	Complex media	RPMI-1640, IMDM	Supports wide range of mammalian cells

Natural Media

Natural media consist solely of naturally occurring biological fluids. Natural media are very useful and convenient for a wide range of animal cell culture. The major disadvantage of natural media is its poor reproducibility due to lack of knowledge of the exact composition of these natural media.

Artificial Media

Artificial or synthetic media are prepared by adding nutrients (both organic and inorganic), vitamins, salts, O_2 and CO_2 gas phases, serum proteins, carbohydrates, cofactors .

Artificial media are grouped into four categories:

Serum containing media

Fetal bovine serum is the most common supplement in animal cell culture media. It is used as a low-cost supplement to provide an optimal culture medium. Serum provides carriers or chelators for labile or water-insoluble nutrients, hormones and growth factors, protease inhibitors, and binds and neutralizes toxic moieties.

Serum-free media

Presence of serum in the media has many drawbacks and can lead to serious misinterpretations in immunological studies. A number of serum-free media have been developed . These media are generally specifically formulated to support the culture of a single cell type and incorporate defined quantities of purified growth factors, lipoproteins, and other proteins, which are otherwise usually provided by the serum. These media are also referred to as 'defined culture media' since the components in these media are known .

Chemically defined media

These media contain contamination-free ultra pure inorganic and organic ingredients, and may also contain pure protein additives, like growth factors . Their constituents are produced in

bacteria or yeast by genetic engineering with the addition of vitamins, cholesterol, specific amino acids, and fatty acids.

Protein-free media

Protein-free media do not contain any protein and only contain non-protein constituents. Compared to serum-supplemented media, use of protein-free media promotes superior cell growth and protein expression and facilitates downstream purification of any expressed product. Formulations like MEM, RPMI-1640 are protein-free and protein supplement is provided when required.

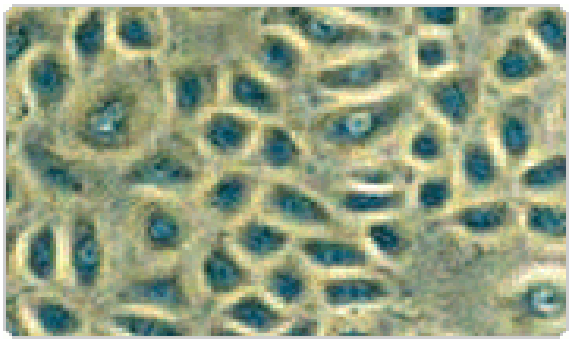
Morphology of Cells in Culture

Cells in culture can be divided in to three basic categories based on their shape and appearance.

Fibroblastic (or fibroblast-like) cells are bipolar or multipolar, have elongated shapes, and grow attached to a substrate.

Epithelial-like cells are polygonal in shape with more regular dimensions, and grow attached to a substrate in discrete patches.

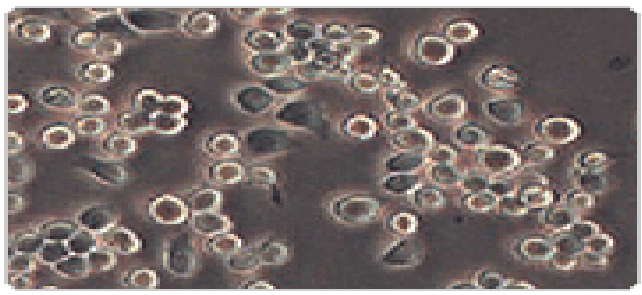
Lymphoblast-like cells are spherical in shape and usually grown in suspension without attaching to a surface.



Applications of cell culture

Cell culture is one of the major tools used in cellular and molecular biology, providing excellent model systems for studying the normal physiology and biochemistry of cells (e.g., metabolic studies, aging), the effects of drugs and toxic compounds on the cells and mutagenesis and carcinogenesis. The major advantage of using cell culture for any of these applications is the consistency and reproducibility of results that can be obtained from using a batch of clonal cells.

I. **Model System :**Cell culture are used as model system to study basic cell biology and biochemistry, to study the interaction between cell and disease



causing agents like bacteria, virus, to study the effect of drugs, to study the process of aging and also it is used to study triggers for ageing.

II. **Cancer Research**

The basic difference between normal cell and cancer cell can be studied using animal cell culture technique, as both cells can be cultured in laboratory. Normal cells can be converted into cancer cells by using radiation, chemicals and viruses. Cell culture can be used to

determine the effective drugs for selectively destroy only cancer cells.

III. **Virology**

Animal cell cultures are used to replicate the viruses instead of animals for the production of vaccine. Cell culture can also be used to detect and isolate viruses, and also to study growth and development cycle of viruses. It is also used to study the mode of infection.

IV. **Toxicity Testing:**

Animal cell culture is used to study the effects of new drugs, cosmetics and chemicals on survival and growth of a number of types of cells. Especially liver and kidney cells. Cultured animal cells are also used to determine the maximum permissible dosage of new drugs.

V. **Vaccine Production**:

Cultured animal cells are used in the production of viruses and these viruses are used to produce vaccines. For example vaccines for deadly diseases like polio, rabies, chicken pox, measles and hepatitis B are produced using animal cell culture.

VI. **Genetically Engineered Protein:**

Animal cell cultures are used to produce commercially important genetically engineered proteins such as monoclonal antibodies, insulin, hormones, and much more.

VII. **Replacement Tissue or Organ:**

Animal cell culture can be used as replacement tissue or organs. For example artificial skin can be produced using this technique to treat patients with burns and ulcers. However research is going on artificial organ culture such as liver, kidney and pancreas. Organ culture techniques and research are being conducted on both embryonic and adult stem cell culture. These cells have the capacity to differentiate into many different types of cells and organs.

VIII. **Genetic Counseling:**

Fetal cell culture extracted from pregnant

women can be used to study or examine the abnormalities of

chromosomes, genes using karyotyping, and these findings can be used in early detection of fetal disorders.

IX. **Genetic Engineering:**

Cultured animal cells can be used to introduce new genetic material like DNA or RNA into the cell. These can be used to study the expression of new genes and its effect on the health of the cell. Insect cells are used to produce commercially important proteins by infecting them with genetically altered baculoviruses.

X. **Gene Therapy:**

Cultured animal cells can be genetically altered and can be used in gene therapy technique. First cells are removed from the patient lacking a functional gene or

missing a functional gene. These genes are replaced by functional genes and altered cells are culture and grown in laboratory condition. Then these altered cells are introduced into the patient.

XI. **Drug Screening and Development:**

Animal cell cultures are used to study the cytotoxicity of new drug. This is also used to find out the effective and safe dosage of new drugs. Now these tests are being conducted in 384 and 1536 well plates. Cell-based assay plays an important role in pharmaceutical industry.

CONCLUSION

A single cell is the building block for life. The genetic material of each cell in the body - itself composed of 100 trillion cells - holds the secret to inherited diseases, such as Tay Sachs, cystic fibrosis and other complex diseases like heart disease. Tissue culture is free of the variations that might arise in the whole organism - in response to normal and induced experimental stress. But now cell culture technique plays an important role in research and development of drug discovery and also helps in improving the health and quality of life of patients suffering from dangerous diseases like cancer, genetic disorders.

Kappa Huda Nangala- A Boost to Cotton production

(An Indigenous Farmer Friendly Cotton Ridger)

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Abstract

Cotton is a predominant cash crop grown in seven north-eastern blocks of Kalahandi district of Orissa. Cotton cultivable area of the district is 19.5 thousand ha with average productivity of 10 qtl /ha. Due to favourable climatic condition and suitable soil type (black cotton soil) cotton is widely grown by the farmers of this region. It is one of the major sources of income of the people.

INTRODUCTION

Cotton cultivation requires a no .of timely intercultural operations. Each time a large no. of labourers is required. For example, in earthing up, 10-12 labourers are required for 1 acre of cotton land. But it is not only difficult on the part of the farmers to avail the required no.of labourers but also seems impracticable to afford the heavy investment in the labour payment. On this background, an idea of creating some useful, innovative and labour saving implement came into the mind of a cotton grower of Bengalpada village of Kesinga block. They invented a new implement named ***Kappa Huda Nangala*** *(Cotton Ridger)* which not only solved the problems (heavy charges of labour & insufficient manpower) of cotton growers but also increased the production of cotton upto 30%.

Kappa Huda Nangala, is a well designed & cost effective tool which is easily affordable by all farmers. It is made up of some wooden & iron plates. Previously it had been made up of wooden plates, but due to some kind of operational problem it was modified with iron plates to increase its operational efficiency. The implement is made in 75^0 angle with the base and the degree varies according to the height of the ploughing bullocks.

The base of the implement is made up of thick wood almost of triangular shape, which is narrowed down upside. The bended iron plates are placed vertically two sides of the wooden base & strong wooden handle is attached to it. The implement is attached with the plough and two persons needed to operate it in the field. Technically it is made keeping in mind the planting distance of the cotton plant so that with the moving of this implement it won't damage the plant.

Cost of this implement

Wooden base - 150/-

Iron sheet (5kgs) - 500/-

Nut bolt - 150/-

(3 big size &

26 small size)

Labour cost – 700/-

Total - 1500/-

In cotton crop, weed management and moisture content in the plant is much essential for better production. In traditional system, while earthing up, the labourers hardly pay attention to the weed control or moisture content in the plant. They just earth up the land ignoring the essentialities required for growth of the cotton plant which results into lower yield of cotton crop. But with this implement both these problems get solved.

When the implement is operated in the field, its bended vertically placed iron plates helps in lifting the soil by placing it in the both sides of the cotton plant, which results into control over weed infestation and helps in conserving moisture in the plant. This implement is used 21 days after sowing, thrice in every 15 days.

In cotton cultivation earthing up is the most crucial, tedious and expensive operation. But now with the help of this implement the operation become easier and the labour cost is reduced to a maximum extent.Two persons are sufficient for earthing up of one acre of cotton field with much less time as against 10-12 persons in the usual practice.. Traditionally for earthing up of cotton crop an amount of 4400/- were spent towards labour cost while with this implement an amount of 1900/- is spent for this and in some cases the farmer

himself operates this implement as it is very comfortable and time saving. So in earthing up a total of an amount of 2500/- per acre are saved by the farmer.

The technically equipped implement not only saves the labour cost but also increase the production of the cotton. As per his version, he was able to get 6-7 qtl/ha by usual practice of weed management but using this implement he could able to get 9-10 qtl/ha with an increased production of 30%.

The advantages of this implement

- ✓ It is well designed and cost effective implement
- ✓ It saves time and labour cost to a great extent
- ✓ It works efficiently by replacing the traditional system of operation by reducing the man power
- ✓ It controls weed infestation and conserve moisture at the base of the plant
- ✓ It increase the cotton yield upto 30%

That impliment inventor farmers who not only solved the problem of the farmers but also showed a great light for the cotton growers. Every cotton grower should know the technicality to prepare this implement and use it in their field to reduce labour cost and increase their production. Now not only they but all the people of the locality have known how to prepare this implement and how to use it in the field. They expresses that they does not want reward or recognition but they always wants that cotton grower should be benefitted from this small implement by which they can raise their standard of living. There is no doubt; if a farmer wants to change his situation no power can stop him to bring change. The farmers are surely a great example**,** a source of encouragement and inspiration to all the farmers of our country.

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Future of Dairy Sector: Sex Semen Technology

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Abstract

Sex semen technology is a newly emerging technology in the dairy sector. It is the process of separating the sperms i.e. male/female progeny. This technology is developed by the USDA researchers. There is no agency producing sex semen in India. This technology is adopted by some of the states like Punjab, Kerala and Haryana etc. High cost and low fertility limits the use of this technology. This technology is helpful in producing female calves, as this leads to increase the profit of the farmers. In near future this is very important technology for the development of dairy sector.

INTRODUCTION

This is the Process of sorting the desired sex sperm that are most likely male or female progeny. Sex semen is defined as semen that has been separated to contain sperm that will produce progenies of desired sex type. This technology is developed by the USDA (United State Department of Agriculture) researchers in Livermore, California and Beltsville, Maryland. This technology was patented as ***"Beltsville Sperm sexing technology"***. The commercialization of this technology started in United State in 2001 with a license granted to Sexed Technologies (ST), Texas. Now, ST commercially produces sex sorted semen in many countries like USA, China, Mexico, Japan, Brazil and Mexico. It is reported that use of sexed semen provides 80-90% accuracy as compared to the conventional method where male: female ratio is about 50:50.

SEX SEMEN STATUS IN INDIA:

The demand of sex semen is increasing in order to dispose large number of stray male. Currently, there is no agency producing sexed semen in India. It is imported from other countries to India. The technology of sex sorting of semen is not available in India. A pilot programme is going on the use of sex sorted semen in Indian field conditions. This is implemented by BAIF and NNDB in collaboration with several participatory agencies. For this semen is exported from the USA by BAIF, Maharashtra. A few organizations in India are using sex

sorted semen but all are importing the sexed semen from USA, Canada or Europe. Presently few organizations in India are working on development of indigenous technology for sex sorting of semen but still it is in very infantile stage of development. Sexed semen is not available for all breeds of the cattle and buffalo in India. It is available for Holstein Friesian and Jersey breeds. This sex semen is imported with the approval from State Animal Husbandry department and keeping record of progeny born form the imported semen is important. Sexed semen is available at the rate of Rs.1, 500 to 2,000 per dose. However, some states are making it available at a subsidized rate. In India, this technique is gradually adopted by many states like Punjab, Haryana, Bengal and Kerala etc. But because of high cost and low fertility limits the use of this technique across the country. This technique requires excellent and careful management of animals.

Govt.of India has assigned the responsibility for sorting of semen in cattle to the NDRI, Karnal.

ADVANTAGES OF USING SEX SEMEN TECHNOLOGY:

- Production of only female calves helps the farmer to save resources as that have been shared with male calves.
- In increases the female number, thereby increasing the supply of milk and replacement of heifers.
- It is helpful to earn more profit by selling the surplus heifers to other farmers.
- It helps in speed up genetic improvement through increasing efficiency of the progeny test programme and embryo transfer programme.
- It improves the bio-security. It increases the herd strength with no risk of introducing diseases by purchasing heifers from outside.
- During the sorting process, damaged sperms are removed. Viable sperms make the sexed semen more successful than conventional semen.
- By producing more female calves using sexed semen, there will be less difficult births compared to male calves (dystocia). This is particularly useful for maiden heifers.
- This will not only produce the more female, but also producing male of superior quality from elite cows for future breeding.

CONSTRAINTS/PROBLEMS IN SEX SEMEN TECHNOLOGY

- **High cost of machinery:** The cost of the machinery is very high.
- **Low conception rate:** Conception rate is very low in case of sex semen technology As compared to conventional semen (10-20%). Sex semen may be affected by the various physical and chemical factors. Conception rate is also affected by the site of deposition of semen in the uterus. Conception rate is more when sexed semen deposited in the body of the uterus rather than horn of the uterus.
- **Lack of skilled manpower:** Experience and skill is required for the insemination. Proper skills are lacked in the manpower.

- **Low number of elite bulls:** The low number of elite bulls limits the option for sex semen.
- There is no commercial availability of this technique. Sex semen is not available for Indian breeds of cattle. Insemination has lower sperm numbers per dose (about 2 million sperm) than are used conventionally (usually >10 million sperm/dose). Although sex sorting procedures damage sperm from the standpoint of fertility, the animal gives birth to abnormal offspring.

CONCLUSION

Sex semen technology is very helpful for the dairy sector development. It has both pros and cons in this. For development of dairy, this is the potential area for research. This technology is adopted in many regions in India. There is need to train the persons and decline in cost for acceptance of this technology in all over India.

Prominent weeds in Cereal fodder crops and their management

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Abstract

The importance of weed control in forage production should not be overlooked, especially when you consider the high investment associated cereal forages. Weeds reduce forage yield by competing for water, sunlight, and nutrients. In addition to yield losses, weeds can also lower forage quality, increase the incidence of disease and insect problems, cause premature stand loss, and create harvesting problems. Some weeds are unpalatable to livestock or, in some cases, may be poisonous. According to V. M. Bhan (1999) presence of weeds in general reduces crop yields by 31.5% (22. 7% in winter season and 36.5% in summer and kharif season). But as the farmers adopt some kind of weeding practices on their fields, a conservative estimate of 10% loss in crop yields may be taken as more realistic.

Key Words: Irrigation, Planting Sorghum, Weeds

INTRODUCTION

The total area under cultivated fodder is only 8.4 m ha (less than 5%) which is static since last two decades, so the fodder production in the country is not sufficient to meet the requirements. At present, the country faces a net deficit of 61.1% green fodder, 21.9% dry crop residues and 64% feeds. This gap in demand and supply may further rise due to consistent growth of livestock population at the rate of 1.23% in the coming years. The objective of the increased milk production can be met only through ensuring availability of good quality fodder in balanced ratio. In this scenario weed management is an important aspect in relation to increase the production of fodder crops.

Concept of Weed:

Weeds are plants growing in the wrong place. For apple orchards, this usually means plants growing directly under the trees. Most apple orchards benefit from a grass sod between the rows, but some plants that establish in the grass, such as dandelions, may be undesirable.

"Weeds are undesirable plants which affect crop production, both quality and quantity and other resource utilization and income generation activities of the humans by

interfering the cultivation/utilization of land, water and/or other resources."
-EWRS (1986; cited in Zimdahl, 1999)

Weeds compete with the beneficial and desired vegetation in crop lands, forests, aquatic systems etc. and poses great problem in non-cropped areas like industrial sites, road/rail lines, air fields, landscape plantings, water tanks and water ways etc. Weeds are an important factor in the management of all land and water resources, but its effect is greatest on agriculture. Weeds compete with trees for moisture and nutrients. Some weeds are also alternate hosts of diseases, nematodes or insects, e.g. black rot fungi, phytoplasms, root-lesion nematodes or tarnished plant bug (e.g. on chickweed). Interference from weeds may also cause labour inefficiencies e.g. tall weeds at harvest, discomfort from allergies (e.g. ragweed) or skin irritations from poison ivy, stinging nettles or thistles. The losses caused by weeds exceed the losses caused by any other category of agricultural pests. Of the total annual loss in agriculture produce, weeds account for 45%, insect 30%, disease 20% and other pests 5%.

Cereal Fodder Crops:

Cereals are the crop plants belonging to grass family Gramineae and grown for their edible starch seeds botanically known as 'caryopsis'. Cereal fodders and grasses are characteristically determinate in growth habit and their herbage quality starts deteriorating after flowering. Cereal fodders like maize, sorghum, pearl millet and oats provide energy-rich herbage to livestock. These have wider adaptability and variability in terms of growth, regeneration potential, yield and quality of herbage.

Maize:

Maize (*Zea mays* L.) is one of the most important fodder crops grown throughout the country particularly for milch animals. The crop is grown in over 0.9 million ha in different parts of the country throughout the year. It is a C4 plant having high fodder production capacity in short duration. It is susceptible to water logging. In the early stage upto 35 days after sowing, the crop is drought tolerant. It is quick growing, high yielding and provides palatable and nutritious forage which can be fed at any stage of growth without any risk to animals. Maize produces good quality herbaceous fodder with high digestibility. On an average, it contains 9-10% crude protein, 60-64% neutral detergent fibre, 38-41% acid detergent fibre, 28-30% cellulose and 23-25% hemi cellulose on dry matter basis when harvested at milk to early-dough stage. It can be fed as green or dry and makes excellent silage.

Weed Management:

Maize suffers due to weed menace in early growth stage of 35-40 days. During this period, crop should be free from weeds for better plant stand and subsequent growth. At 3-4 weeks crop stage, hoeing with weeder cum mulcher controls the weeds effectively. Pre-emergence spray of Atrazine @ 0.75-1.00 kg a.i. /ha in 600 litres of water ensures effective control of weeds.

Millets:

Pearl millet is important forage of tropical climate grown over a wide range of soils. It is nutritious and palatable and can be

fed as green, dry or as conserved fodder in the form of silage or hay. On an average it contains 7-10 % crude protein, 56-64 %, neutral detergent fibre, 38-41 % acid detergent fibre, 33-34 % cellulose and 18-23 % hemi cellulose on dry matter basis when harvested at 50 % flowering stage. It survives well in condition of soil moisture stress and performs better than sorghum.

Weed Management:

One hoeing through weeder cum mulcher at critical crop stage i.e. 3-4 weeks is very effective to control the weeds. Use of herbicide like atrazine @ 0.50 kg a.i. /ha as Pre-emergence in 600 litres of water controls the weeds effectively. This should be applied only in pure crop of pearl millet. In intercropping of pearl millet with cowpea or guar, pre emergence spraying of alachlor @ 1.0 kg a.i. /ha should be done.

Sorghum:

It is nutritious and palatable and can be fed as green, dry or as conserved fodder in the form of silage or hay. On an average it contains 9-10 % crude protein (CP), 65-65 %, neutral detergent fibre (NDF), 37-42 % acid detergent fibre (ADF), 32 % cellulose and 21-23 % hemi cellulose on dry matter basis when harvested at 50 % flowering stage. Its stover contains 6.0-6.4 % crude protein and 32-36 % crude fibre. Sorghum plants, particularly young plants, contain an alkaloid, which releases hydrocyanic, or prussic acid, when hydrolyzed. This can be toxic to livestock. When the crop is cut and field-cured, or is ensiled, the hydrocyanic acid degrades (2 to 3 weeks after ensiling), greatly reducing the toxicity. To overcome the possibility of HCN poisoning, the crop should be properly irrigated during summer and harvested only after 40-45 days of growth. During periods of drought or other stresses, sorghum tends to accumulate nitrates, which can be toxic to livestock. In the case of high nitrate levels, the forage should be ensiled or combined with other feeds low in nitrate to reduce daily nitrate intake.

Weed Management:

I. For Irrigated sorghum

- Apply PE Atrazine @ 0.25 kg/ha on 3-5 DAS followed by 2,4-D @ 1 kg/ha on 20-25 DAS on the soil surface, using Backpack/Knapsack/Rocker sprayer fitted with a flat fan nozzle using 500 litres of water/ha (or) if herbicides are not used, hand weeding twice on 10-15 DAS and 30-35 DAS.
- In line sown crop, apply PE Atrazine @ 0.25 kg/ha on 3-5 DAS followed by Twin Wheel hoe weeder weeding on 30-35 DAS.
- In transplanted crop, apply PE Atrazine @ 0.25 kg/ha on 3-5 DAT followed by 2,4-D @ 1 kg/ha on 20-25 DAT.
- If pulse crop is to be raised as an intercrop in sorghum do not use Atrazine, spray PE Pendimethalin @ 0.75 kg/ha on 3-5 DAS

II. FOR RAIN-FED SORGHUM

- Keep sorghum field free of weeds from second week after germination till 5th week. If sufficient moisture is available spray Atrazine 0.25 kg/ha as pre-emergence application within 3 days after the receipt of the soaking rainfall for sole sorghum and for sorghum based intercropping system with

pulses, use Pendimethalin at 0.75 kg/ha.

- Sorghum intercropped with cowpea as a pre- plant incorporation of isoproturon @ 0.5 kg/ha and Pendimethalin 1.0 kg/ha will be safer for both the crops after 1st and 2nd spell of rainfall.

Teosinte (Mak-chari):

It is an excellent multicut fodder and grows well in warm regions with high humidity and rainfall. It is well adapted to humid tropics and subtropics. It produces tillers profusely and has dark green narrow leaves which remain green for a longer period. The crop is suitable to be grown in acidic soil and in areas where water stagnates. Teosinte strongly resembles maize in many ways, notably their tassel (male inflorescence) morphology. Teosinte are distinguished from maize most obviously by their numerous branches each bearing bunches of distinctive, small female inflorescences.

Weed Management:

At 3-4 weeks crop stage, hoeing with weeder cum mulcher can control the weeds effectively. Pre-emergence spray of Atrazine @ 0.75 kg a.i./ha in 600 litres of water ensures effective control of weeds.

Oat (Jai):

It is the most important cereal fodder crop grown in winter in north western, central India and is now extending to the eastern region. Oat ranks sixth in world cereal production following wheat, maize, rice, barley and sorghum. It is important winter forage in many parts of the world and is grown as multipurpose crop for grain, pasture, forage or as a rotation crop. Oat requires a long and cool season for its growth; therefore, it is successfully grown in the plains and hilly areas of the country. The crop occupies maximum area in Uttar Pradesh (34%), followed by Punjab (20%), Bihar (16%), Haryana (9%) and Madhya Pradesh (6%).

Weed Management:

The vigorous growth of oats tends to choke out most weeds. A few tall broadleaf weeds, such as ragweed, goosegrass, wild mustard, and buttonweed (velvetleaf), occasionally create a problem, as they complicate harvest and reduce yields. These can be controlled with a modest application of a broadleaf herbicide, such as 2,4-D, while the weeds are still small

Barley:

In last couple of years, it was observed that dual purpose barley can be utilized as an alternative source of green forage in the arid and semi-arid regions as parts of states like Rajasthan, Haryana, Punjab, M.P. and U.P due to increasing scarcity of green forage availability.

Weed Management:

Spray Isoproturon 800 g/ha as pre-emergence spraying 3 days after sowing followed by one hand weeding on 35th day after sowing. If herbicide is not applied, give two hands weeding on 20th and 35th day after sowing.

Integrated Weed Management in Cereal Fodder Crops

IWM: An integrated weed management may be defined as the combination of two or more weed-control methods at low input levels to reduce weed competition in a given cropping system below the economical threshold level. It has proved

to be a valuable concept in a few cases, though much is still to be done to extend it to the small farmers' level.

Integrated Weed Management (IWM) approach aims at minimizing the residue problem in plant, soil, air and water. An IWM involves the utilization of a combination of mechanical, chemical and cultural practices of weed management in a planned sequence, so designed as not to affect the ecosystem.

Why IWM?

One method of weed control may be effective and economical in a situation and it may not be so in other situation.

- No single herbicide is effective in controlling wide range of weed flora
- Continuous use of same herbicide creates resistance in escaped weed flora or causes shift in the flora.
- Continuous use of only one practice may result in some undesirable effects. Eg. Rice –wheat cropping system – *Phalaris minor*
- Only one method of weed control may lead to increase in population of particular weed.
- Indiscriminate herbicide use and its effects on the environment and human health.

Among the commonly suggested indirect methods are land preparation, water management, plant spacing, seed rate, cultivar use, and fertilizer application. Direct methods include manual, cultural, mechanical and chemical methods of weed control.

Good IWM should be flexible enough to incorporate innovations and practical experiences of local farmers. It should be developed for the whole farm and not for just one or two fields and hence it should be extended to irrigation channels, road sides and other non-crop surroundings on the farm from where most weeds find their way in to the crop fields.It should beeconomically viable and practically feasible.

Advantages of IWM

- ✓ Prevents weed shift towards perennial nature
- ✓ Prevents resistance in weeds to herbicides
- ✓ No danger of herbicide residue in soil or plant
- ✓ No environmental pollution
- ✓ Gives higher net return
- ✓ Suitable for high cropping intensity

IWM include following methods:

I. Biological Methods of Weed Control

1. Bio agent like insects, pathogen etc., and other animals are used to control weeds.
2. Insect and pathogens infest weeds and they either reduce growth or kill weeds.
3. Biological control method can reduce weeds but it is not possible to eradicate weeds.

II. CULTURAL METHODS OF WEED CONTROL

Several cultural practices like tillage, planting, fertilizer application, irrigation etc., are employed for creating favourable condition for the crop. These practices if used properly help in controlling weeds. Cultural methods, alone cannot control weeds, but help in reducing weed population.

- **Field Preparation**

1. Flowering of weeds should not be allowed. This helps in prevention of

build-up of weed seed population in the fields.
2. Irrigation channels are the important sources of spreading weed seeds. So it is essential to keep irrigation channels clean.
3. Deep ploughing in summer exposes and kills underground parts like rhizomes and tubers of perennial and abnoxious weeds.
4. Running blade harrows cuts weeds and kills them.
5. In lowland rice, puddling operation incorporates all the weeds in the soil which would decompose in course of time.

- **Planting Method**

1. Sowing of clean crop seeds without weed seeds should be done. It is a preventive method against introduction of weeds.
2. Sowings are taken up one to three days after rainfall or irrigation depending on soil type. Weeds already present in the soil start geminating within two or three days.
3. Sowing operation with seed drill removes some of the germinating weeds.
4. Transplanting is another operation which reduces weed population. Since, the crop has an additional advantage due to its age.

- **Varieties**

1. Short stature and erect leaved varieties susceptible to more weed competition compared to tall and leafy traditional varieties.
2. Weeds continue to germinate for long time in 'dwarf varieties resulting in high weed growth.

- **Planting Density**

1. Closer planting of crops suppresses germination and growth of weeds.
2. Wider planting should be avoided

- **Fertiliser Application**

1. Plants differ in their capacity to respond to fertiliser application.
2. Crops like sorghum, maize, pearl millet and rice grow at a faster rate when nitrogenous fertilisers are applied and cover the soil earlier.
3. Weeds like *Cynodon dactylon, Cyperus rotundus* do not respond to nitrogen application and they are suppressed by fast growing crops.

- **Irrigation and Drainage**

1. Depending on the method of irrigation, weed infestation may be increased or decreased.
2. Frequent irrigation or rain induces several flushes of weeds.
3. In lowland rice, germination of weeds is less due to continuous water stagnation.
4. Continuous submergence with 5 cm water results in reducing weed population whereas under upland situation, weed population and weed dry matter is very high

III. PHYSICAL METHODS OF WEED CONTROL:

Physical force either manual, animal or mechanical power is used to pull out or kill weeds. Depending on weed and crop situation one or combination of these methods are used.

- **Hand-weeding**

1. Pulling out weeds by hand or uprooting weeds by using small hand tool is known as hand weeding. It requires two operation

2. The number of hand weeding to be done depends on crop growth, weed growth and critical period of crop-weed competition.
3. The number of hand weeding range from 2-4 for most of the field crops.
4. The interval between two weeding depends on the quickness of weed growth which interferes with crop growth. Generally, it is 15-20days.

- **Hand hoeing**

1. The entire surface soil is dug to a shallow depth with the help of hand hoes, weeds are uprooted and removed.
2. After hand hoeing, the field is subjected to drying to avoid re-establishing of uprooted weeds.
3. It is adopted in irrigated upland crops like finger millet, pearl millet, onion etc.

- **Digging**

1. Weeds are removed by digging up to deeper layers so as to remove underground storage organs.
2. It is very useful in the case of perennial weeds and it is done with the help of pick axes or crowbars like *Cynodon dactylon*.

- **Mowing**

1. Mowing is the cutting of weeds to the ground level.
2. Mowing is usually practiced in non-cropped areas, lawns and gardens wherein the grass is cut to a uniform height to improve the aesthetic value.
3. The common mowing tools are sickle, scythe and lawn mower.

- **Cutting**

1. Weeds are cut above the ground surface leaving stubble. It is most common practice against brush and trees.
2. Cutting is done with the help of axes and saws.

- **Dredging and Chaining**

1. Dredging and chaining methods are used to control aquatic weeds.
2. Removing of weeds along with their roots and rhizomes with the help of mechanical force is called dredging.
3. The floating aquatic weeds are removed by chaining.
4. A very heavy chain is pulled over the water bodies to collect the weeds.

- **Mulches**

1. Mulches when applied on soil surface, do not allow weeds to germinate or to grow as light does not reach the soil.

- **Intercultivation**

1. Intercultivation is a very effective and cheap method of weed control in line-sown crops. Intercultivation implements have a blade which cuts the weeds just below the soil surface and thus kill weeds. It also makes the surface soil loose and dry so that subsequent germination of weeds is avoided unless irrigation or rain follows.

IV. CHEMICAL WEED CONTROL

1. Soil Application

- **Soil surface application:** Herbicides are usually applied to soil surface to form a uniform herbicide layer. The applied herbicides, due to their low solubility may penetrate only few centimeters into the soil. Weeds germinating in the top layers are killed due to incidental absorption of herbicides. eg. triazines, ureas and anilide.
- **Soil incorporation:** Some herbicides are applied to soil surface and

incorporated into the soil either by tillage or irrigation for their effectiveness. eg. Volatile herbicides viz., aniline and carbamate.

- **Sub-surface application:** Perennial weeds like Cyperus rotundus and Cynodon dactylon are controlled by injecting herbicides to the lower layers of the soil.
- **Band application:** Herbicides are applied as narrow bands over or along the crop row. The weeds in between the crop rows can be controlled by intercultivation or band application of herbicide. This method is useful where labour is expensive and intercultivation is possible. eg. Weeds in maize can be controlled effectively by spraying atrazine on seed row at the time of sowing.

2. **Foliar application**

- **Blanket application:** Application of herbicide over the entire leaf area. Selective herbicides are applied by this method.
- **Directed Application:** Herbicides are applied directly to weeds between crop rows, avoiding the crop foliage. Care is taken to avoid spray fluid falling on the crop.
- **Spot application:** Herbicides are applied or poured on small patches of weeds, leaving the relatively wee free patches untreated. It minimizes the herbicide usage per unit area.

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Table 1: Prominent Weed Flora in Maize/Millet/Sorghum/Teosinte

Sl. No.	Botanical Name	Vernacular Name
Annual Grass Weeds		
1	*Commelina nudiflora*	Choti kankaua
2	*Digitaria sanguinalis*	Large crabgrass
3	*Eleusine indica*	Goose grasss
4	*Echinochloa colona*	Jungle rice
5	*Setaria glauca*	Yellow foxtail
Annual Broad-Leaved Weeds		
7	*Amarnthus viridis*	Slender pigweed
8	*Ageratum conyzoides*	Billgoat weed
9	*Celosia argentea*	Quail grass
10	*Datura stramonium*	Thorn apple
11	*Euphorbia hirta*	Garden spurge
Perennial Weeds		
A.	Grasses	
12	*Cynodon dactylon*	Dub grass
13	*Digitaria abyssinica*	Blue couchgrass
14	*Sorghum halepense*	Johnsongrass
B.	Sedges	
15	*Cyperus esculentus*	Yellow nutsedge
16	*C. rotundus*	Cocograss/nutsedge
C.	Broad Leaved weeds	
17	*Convolvulus arvensis*	Field bind weed
18	*Oxalis latifolia*	Simple perennial wood sorrel
19	*O. corniculata*	Indian sorrel
D	Parasitic Weeds	
20	*Striga asiatica (=lutea)*	Witch weed

Table 2: Prominent Weed Flora in Oat and Barley

Sl. No.	Botanical Name	Vernacular Name
Annual Grass Weeds		
1	*Phalaris minor*	Canary grass
2	*Avena fatua*	Wild oat
3	*Asphodelus tenuifolius*	Jungli piajzi
4	*Commelina spp.*	False flax
6	*Digitaria spp.*	Couch grass
Annual Broad-Leaved Weeds		
7	*Amaranthus hybridus*	Smooth pigweed
8	*Anagallis arvensis*	Scarlet/blue pimpernel
9	*Canabis sativa*	Hemp
10	*Chenopodium album*	Dogs tooth grass
11	*C. murale*	Nettle leaf goosefoot

Table 3: Examples of Biological Weed Control

Bio-agent	Weeds
Insect	
Two beetles: *Octotoma scabripennis and Uroplata giraldi*	*Lantana camara*
Scale insect *Dactylopiu stomentosus*	Prickly-pear weed – *Opuntia sp.*
Flea beetle : *Agasicles hygrophyla*	Alligator weed – *Alternanthera philoxeroides*
Fish	
Common carp *(Cyprimus carpio)* Chinese carp	Aquatic weeds
Mammals: Manetee or sea-cow	Water hyacinth
Snails: Marisa sp and other fresh water snails	Submerged weeds like coon tail and algae
Fungi : *Rhizoctinia* blight.	Hyacinth
Mites *: Tetranychus sp.*	Prickly pear
Plants : Cowpea as intercrop in sorghum	Effectively reduces the growth of weeds in sorghum

General Health and Management of Dairy Calves

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Calf diseases have a major impact on the economic viability of cattle operations, due to the direct costs of calf losses and treatment and the long term effects on performance. Calf health should be prioritized as one of the most important animal health issues. To ensure the production of sound dairy herd, some basic principles should be adopted. Under this article basic information regarding general health and management procedures are discussed.

Care of navel cord

First step to take care of navel cord of the new born calves. It should be cut with utmost care by ensuring the length of navel cord at least 2-3 cm from the body with new clean and sharp blade. Make a proper ligature of Navel cord and also wipe the navel with tincture iodine solution to prevent the infection. As the navel's umbilicus vessels directly attached to various internal organs so infection of the navel may be harmful to the newborn calves. Dipping of the navel should be done shortly after birth and before drying of the navel.

Colostrum feeding

Feeding of the colostrum should be ensuring just after birth (Within one hour of birth). As calves are very susceptible for the infections like pneumonia, calf scour diarrhea so the feeding of colostrums to calves provides immunity and help for optimum growth of the calves. One thing should be kept in mind that the quantity of colostrums (e.g. one tenth of body weight) and frequency of colostrums feeding (3-4 times in a day) should be assured.

Identification of calves

Identification of new born calves is very important for easy rearing and smooth day to day activities of dairy farms. Identification of calf should be positively determined before removing the calf from the dam. Correct identification helps in record keeping, genetic evaluation of animal, its progeny and parents. Numbered ear tag (plastic or metal tag), numbered neck strip, tattooing etc. may be used. For proper record birth dates of calves, registration number, tag number, sires and dam's number should be maintained in farm record book.

Figure 1: Ear Tagging Machine with Plastic Ear Tag

Extra teats

Sometimes extra teats are present which should be removed at an early age to make the milking smooth in later life. Extra teats should be cut with sterile scissor and antiseptic should be applied to cure the wound.

Disbudding of calves

For commercial dairy horns serve no usefull purpose except in some breed specific identification. There are chances of body and udder injuries. For routine prevention of horn development the golden rule is the earlier the better. Smaller calves have smaller horn buds, which are easier to remove and much less likely to grow back. Small calves are also easier and safer to handle. Disbudding should be done at optimum age (e.g. 10 days after birth) when horn buttons are small. It is a technical work and requires expertisation. There are several method available for dehorning depending on the availability and easiness of the method.

Chemical methods:

1) **Caustic potash sticks:** This is mostly used on calves over 3 weeks old. At very young age this method works very well. For this clip the hairs and clean the horn bud area. Make the potash stick moist and rub till the redness appears. Precaution should be taken during application to avoid using too much caustic and also avoid contact with skin of the applicator.
2) **Electric dehorner:** This is basically used on calves over 4 month age. This just acts as soldering irons and used to destroy horn buttons by burning the nerves and blood vessels. During application of electric dehorning optimum voltage and time of contact at horn bud should be given prime attention.
3) **Saw or horn clippers:** For older animals horn clippers or saw can be used. In older animals horns are hard and long so require more labor. To avoid the infection and contamination, dehorning should be done in sunlight and winter season.

Castration: Castration of a bull (male) calf is the process of removal or destruction of the testicles. There are many reasons to castrate a calf as –To produce docile male that are easier to handle. To decrease rearing costs associated with feeding and handling facilities compared to bulls. It has been speculated that, because intact bull calves may grow more rapidly than steer calves, delaying castration until weaning (around 6 months old) can yield similar benefits to growth promoting implants administered when the calves are 1 to 3 months of age, but without additional cost. Most popular method for castration is Burdizzo which is easy to operate and less costly. The Burdizzo method crushes the blood vessels, interrupts the blood supply to the testicle and thus kills the testicle. Good restraint is essential because the Burdizzo must be in place about 10 seconds to crush the artery. The Burdizzo must be in good condition. The

jaws must be parallel and close uniformly across their width so pressure will be evenly distributed across their length. Leave the Burdizzo slightly open when not in use.

Figure 2: Burdizzo Castrator

Calf scour

Calf scour is basically characterized by diarrhea and dehydration. Main source of infection is nutritional imbalance. During this problem continue to feed milk and add electrolytes to compensate the salt and mineral loss. First step taken at this condition is to isolate the affected calves from others. Always provide luke warm water to affected calf. Try to replace the electrolyte solution with milk as the calf recovers. In severe cases take the assistance of veterinarian.

Pneumonia

Main causes of calf's pneumonia are lack of sanitation and hygiene of calf shed, stress and poor ventilation. To answer the question, how know that calf is suffering from pneumonia is to judge the respiration rate and rhythmic pattern of respiration. Labored breathing and rise in temperature is best indicator of the pneumonic condition. Rectal temperatures of calves affected with pneumonia have higher temperature (104^0F) then the normal temperature ($101\text{-}102^0$F).

Other management conditions

Along with these above explained health problems some other conditions also exists.

Bloat

It is basically accumulation of gas in stomach due to excessive feeding of carbohydrate rich feed. To avoid such problems extra care should be taken during feeding the calves. In severe cases immediate veterinary assistance should be taken.

Navel hernia

This condition basically exists when the abdominal wall of calves navel does not close properly. It can be easily diagnosed by observing a lump in the abdominal area of animal body. Case of hernia should be given proper attention and care.

Pink eye

Condition of pink eye characterized by reddening and swelling of eye membranes and watery discharge from the eye. Treat such cases swiftly by antibiotics and affected eye prevented from exposure of direct sunlight.

Parasitic conditions:

Fly control: To make the calf free from diseases it is very important to control menace of fly. Cleaning, sanitation and hygiene of calf pen reduce the chances of fly and use of fly repellant during breeding season proves effective for fly control.

Internal parasites: In newly born calves there are also chances of parasitic infection. To control the internal parasite deworming programme should be ensured. For diagnosis of parasitic

infection, treatment and prevention plan veterinarian assistance may be taken.

Principles of control and prevention of infectious diseases of new born calves:

(1) Removal of the cause of diseases from the environment:

- The newborn should be born in an environment which is clean, dry and conducive for the animal to get up after birth and such the dam.
- Then swabbing of the navel with tincture iodine to prevent the enter of infection.
- Disinfections of the uterus before conception is necessary also. Examination of swabs from the uterine contents before and after treatment in suspected animals.

(2) Removal of the newborn from the infected environment:

- Transfer the newborn to a non-infected environment either temporary or permanently in cases of over crowded barn.
- Removal of the newborn away from the main calving ground.
- Diseased calf should be transferred with his dam to hospital pasture during the period of treatment and convalescence.

(3) Increasing and maintaining the non – specific resistance of the newborn:

- Ingestion of colostrums from dam is so important as the only one source of immunoglobulin to newborn.
- Calf fed about 80 ml / kg body weight of colostrums at 6 hours of age.
- Special nutritional and housing requirements.
- Isolation of newborn calf in calf – rearing unit within few days after birth.
- Provision of suitable environment.

(4) Increasing the specific resistance of the new born:

- Vaccination of dam before parturition to stimulate the production of specific antibodies which are then transferred to the newborn via the colostrums.

Vaccination schedule: Vaccination is the easiest and cheapest way to prevent diseases**.** For better growth, immunity and health of calves strict vaccination schedule should be followed. Prior to vaccination veterinarians suggestion should be taken. Vaccines which are routinely used are given in table below.

Points to be remembered during vaccination:

- For better immune response deworming should be carried out before vaccination.
- The manufacturers' instruction on the route and dosage should be strictly followed
- The cold chain of the vaccines wherever prescribed should be maintained till the time of administration to the animal.

S. N.	Name of the disease	Age and booster dose	Route of vaccine administration	Vaccines available
1	Foot and mouth disease (FMD)	4 months,booster at 2-4 weeks after primary vaccination, Repeat every 6 months	3 ml S/C	Raksha, Futvac
2	Haemorrhagic septicemia (HS)	6 months and above	2 ml S/C	Raksha- HS, Bovilis HS
3	Black quarter (BQ)	6 months and above	2 ml S/C	Black quarter vaccine
4	Brucellosis	4-8 months of age (Only female calves)	2 ml S/C	Bruvax, Brucella vaccine living
5	Theileriosis	3 months of age and above	3 ml S/C	Rakshavac-T
6	Anthrax	4 months and above	1 ml S/C	Raksha Anthrax

CONCLUSION

The health and management of calves are crucial component of profitable dairy farm. Time at the first colostrum feeding and vaccination programs are major factors that affect calves health. Though the causes of the diseases are diverse in nature, poor management practices (feeding, hygiene and sanitation) and poor health care practices are very important. Dairy Farmers have to follow good colostrum feeding management satisfying the quality, quantity and time of colostrum. Vaccination programs should be designed to protect against diseases that occur commonly in calves. The timing of the vaccination is also very important criteria. Good hygiene of calf pens and feeding equipment and Close attention to animal health to minimize the incidence of calf scours, pneumonia and other diseases should be carried out for better results. Don't hesitate to consult veterinarians and other animal health specialists to develop and implement effective calf health programs.

Prosopis cineraria (King of Desert): a multipurpose tree for arid areas

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Prosopis cineraria (L.) Druce (family Leguminosae, subfamily Mimosoideae) is one of 44 species of leguminous trees and shrubs in the genus. It is a small, thorny, irregularly branched tree, 5-10 m high. Evergreen or nearly so, it forms an open crown and has thick, rough gray bark with deep fissures. Leaves are alternate, bipinnately compound with 1-3 pairs of pinnae. Each pinna has 7-14 pairs of leaflets, 15 mm long and 2-4 mm broad. The thorns are straight with a conical base and distributed sparsely along the length of the stem. Khejari is frost-resistant drought resistance and withstand in wild temperature extremes, ranging from 104-114 degrees Fahrenheit in the summer to less than 50 degrees Fahrenheit in the winter. It requires minimum rainfall. Khejari is the preferred plant species for livestock grazing in the area, and it provides shelter to the grazing animals, people, birds with its shade.

An evergreen thorny tree which can grow in very harsh climate & in poor soil, well adapted to the arid conditions and also stands well to the browsing by animals. Slightly frost hardy and tolerant of temperatures up to 50°C, it grows at altitudes from sea level to 600 m. The tree is found in alluvial and coarse, sandy, often alkaline soils where the pH may reach 9.8. In vitro studies have confirmed the nodulation of *P. cineraria*with Rhizobium. Khejri withstands hot winds & dry seasons and exhibits considerable drought hardiness. The tree reproduces freely by root suckers and establishes well from seeds too. The seeds should be soaked for 24 hours before plantation. *P.cineraria* is difficult to propagate by cuttings, although treatment with rooting hormones has proved successful in India. Propagation by root suckers and by air layering has been reported. Recent attention has also been given to micropropagation of this species, but it appears that in vitro propagation is more difficult with *P. cineraria*than with many other Prosopis species. The tree is also considered slower growing than other Prosopis.

The root system of Khejri is long, deep & well developed, securing a firm footing for the plant and allowing it to obtain moisture from ground-water. It do not compete for moisture and nutrients with crops. A symbiotic relationship with some bacteria allow it to fix nitrogen in the soil, improving soil

fertility. Furthermore it also adds organic matter through leaf litter decomposition, rejuvenating poor soils. It coppices readily & profusely. Owing to all these, Khejri is compatible with agrihorticultural crops. The tree boosts the growth and productivity of the companion plants. Due to its importance in afforestation of arid & semi arid areas, rural communities encourage the growth of Khejri in their agricultural fields, pastures & village community lands. Because of its extensive root system, it stabilizes shifting sand dunes and is also useful as a wind-break. Because it is the only tree species in arid regions, it provides provides much needed shade & shelter to the farmers working in the fields as well as to the cattle & wildlife during the summer months.

Plantation and Cultivation

Climate: The tree prefers a dry climate and the most important areas of its distribution are characterized by extremes in temperature. In Punjab it occurs throughout the alluvial plains (rainfall 10-25cms). The tree is a light demander and the older plants are drought resistant. The tree is able to withstand the hottest winds and the driest season, and remains alive when other plants would succumb.

Soil: The tree grows on a variety of soils. It is seen at its best on alluvial soils consisting of various mixtures of sand and clay. It is common on moderately saline soils, it quickly dries out where the soil is very saline.

Multipurpose Uses

Wood:

*P. cineraria*provides excellent firewood (calorific value, cat 5,000 kcal/kg) and charcoal Its wood is favored for cooking and domestic heating (Mahoney 1990). Hard and reasonably durable, the wood has a variety of uses for house building, posts, tool handles, and boat frames, although poor tree form limits its usefulness as timber.

Fodder:

The leaves are an available, excellent, and nutritious fodder, readily eaten by many animals including camels, goats, and donkeys. The tree produces leaves during the extremely dry summer months when most other trees are leafless. Leaves contain 13.8% crude protein, 20% crude fiber, and 18% calcium (FFN 1991). The pods also provide a good fodder, containing a dry, sweet pulp.

Food:

Pods are eaten as a vegetable in the human diet in some areas. In Rajasthan, green pods called sangri are boiled and dried. The flowers are valuable for honey production. The bark can be used in leather tanning and yields an edible gum. Bark and flowers are used medicinally.

Agricultural uses of Khejri

Khejari's diversity make it a valuable "companion" to agricultural crops. Khejari is a nitrogen fixer, which means it improves soil quality by making nitrogen in the soil more available to other plants. Its leaves further improve the soil by adding organic matter. With a taproot that can extend more than 100 feet deep and an extensive root mass , khejari helps stabilize the sandy desert soil and shifting sand dunes. It can serve as a windbreak, protecting farms from strong desert winds, and its wood is excellent for firewood and charcoal.

Environmental conservation

Khejari has a very deep tap root system and hence it does not generally complete with the associated crops. The improved physical soil conditions compared with higher availability of nutrients under the Khejri canopy explain the better growth of the crops associated with it. Due to its extensive root system it stabilizes shifting sand dunes and is also useful as windbreak shelterbelt and in afforestation of dry areas. It fixes atmospheric nitrogen through microbial activities. It adds organic matter through leaf litter decomposition thus rejuvenating poor soils. Since in arid regions, this is the only tree species, it provides much needed shade and shelter to the farmers working in the fields as well as to the cattle and wildlife during the summer months. Pods of Khejari are eaten by cattle, sheep, horses, mules, donkeys, goats, camel and other wildlife in desert especially black buck and chinkara in western Rajasthan have survived by eating pods and leaves of this tree.

Other uses of Khejri

Khejari is most important top feed species providing nutritious and highly palatable green as well as dry fodder, which is readily eaten by camels, cattle, sheep and goats, constituting a major feed requirement of desert livestock. The leaves are of high nutritive value, locally it is called ''Loong''. Feeding of the leaves during winter when no other green fodder is generally available in rain-fed areas is thus profitable. The pods are a sweetish pulp and are also used as fodder for livestock.

Khejari Pods: are locally called ''sangar'' or ''sangri''. The dried pods locally called ''Kho-Kha'' are eaten. Dried pods also form rich animal feed, which is liked by all livestock. Green pods also form rich animal feed, which is liked by drying the young boiled pods. They are also used as famine food and known even to prehistoric man. Even the bark, having an astringent bitter taste, was reportedly eaten during the severe famine of 1899 and 1939. Pod yield is nearly 14,000 kg/km^2 with a variation of 10.7% in dry locations.

Khejari Gum: Khejari produces a brown shining gum just like Arabic Gum which is obtained during the months of April to june.

Khejari wood: is reported to contain high calorific value and provide high quality fuel wood. The lopped branches are good as fencing material.

Medicinal value

Khejari flower is pounded, mixed with sugar and used during pregnancy as safeguard against miscarriage. Water-soluble extract of the residue from methanol extract of the stem bark exhibits anti-inflammatory properties. Khejari plant produces gum, which is obtained during May and June. The bark of the tree is dry, acrid, bitter with a sharp taste; cooling anathematic; tonic, cures leprosy, dysentery, bronchitis, asthma, leucoderma, piles and tremors of the muscles. The smoke of the leaves is good for eye troubles. The pod is considered astringent in Punjab. The bark is used as a remedy for rheumatism, in cough colds, Asthma. The plant is recommended for the treatment of snakebite. The bark is prescribed for scorpion sting. The bark of the tree provides immediate relief to a person bitten by snake or scorpion. Its leaves and fruits are used in preparing

medicines for curing nervous disorders. The medicines prepared from its bark are also used for treating diarrhoea, dysentery, piles, worm infestations and other skin problems. The bark is also used to cure leprosy, bronchitis, asthma, tumour of muscles and to improve concentration. The gum of the tree is nutritive and good in taste and is used by pregnant woman at the time of delivery.

Worship of Khejri

During Vedic times, khejri wood was used to kindle the sacred fire for performing a yajana. In Hindu epics, the Ramayana and the Mahabharata, mention the usefulness and significance of this tree. It is said that Lord Ram orshipped khejri tree, which represents the goddess of power, before he led his army to kill Ravana. The worshipping of this tree is referred to as samipuja. Pandavas also worshipped this tree and hid their weapons in it during their Agyatavasa. Mainly men and married women worship Khejari (jand) tree, in an elaborate way. Gogaji is popular as a snake-god and almost every village in Rajasthan has a Than (sacred place) under a Khejari tree dedicated to him. Gogaji is also venerated as a saint and even as 'snake-god'. A saying about Gogaji. The Bishnois, a community in Rajasthan, would not cut Khejari trees even from their agricultural fields. Among the 29 principles propounded by the founder of the sect prophet, Lord Jhambheshwar, cutting and lopping of green trees is strictly prohibited. The Government of India has recently instituted the 'Amria Devi Bishnoi National Award for Wildlife Conservation' in the memory of Amrita Devi Bishnoi, who in 1731 sacrificed her life along with 363 other members for the protection of khejri trees in Khejarali village near Jodhpur in Rajasthan (Bishnoi a great environmentalist community).

Economy

Khejari tree has played a significant role in the rural economy in the northwest arid region of Indian sub-continent. It is the only indigenous tree species, which has withstood well the rigorous and exacting conditions of the Rajasthan desert. This tree is a legume and it improves soil fertility. It is an important constituent of the vegetation system. It is well adapted to the arid conditions and stands well to the adverse vagaries of climate and browsing by animals. Camels and goats readily browse it. In areas open to goat browsing, the young plants assume cauliflower shaped bushy appearance. Khejri tree used for fodder and fuelwood in villages and provides wood of construction class. It is used for house-building, chiefly as rafters, posts scantlings, doors and windows, agricultural implements and shafts, spokes, fellows and yoke of carts. It can also be used for small turning work and tool-handles. is most important top feed species providing nutritious and highly palatable green as well as dry fodder, which is readily eaten by camels, cattle, sheep and goats, constituting a major feed requirement of desert livestock. Locally it is called Loong.

Domestic plant quarantine in horticultural crops

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In present contest, the major challenge in horticulture is to increase the productivity and quality of produce. There are many factors, which influence the production as well as produce quality. The insects, pest and diseases are the major factor, which influences crop production directly. Transfer of planting material from one place to another place will also carry insect, nematodes and diseases inoculum. The spread of these pest and diseases can be control by avoiding their entry to new area, which is enforced through certain legal measures, among those quarantine is commonly known and widely used. These quarantine regulations are promulgated by the central as well as state governments. The Directorate of Plant Protection, Quarantine and Storage (DPPQS) of Ministry of Agriculture and farmers Welfare is the nodal agency for implementing plant quarantine regulations in India, which have recently been revised and known as the Plant Quarantine (Regulation of Import into India) Order 2003 (henceforth referred to as PQ Order). DPPQS deals with the commercial import of consignments of grains, plants and plant products for consumption through its network of 35 plant quarantine stations spread across the country (Vijay Laxmi *et al.,* 2014).

Photo: agritech.tnau.ac.in

DOMESTIC QUARANTINE OVERVIEW

The domestic quarantine is the restriction imposed by plant quarantine authorities in association with state machinery on the production, movement and existence of plants and planting material, which is brought under regulation in order to prevent the introduction or further spread of insect, pest and disease (Table 1). The plant quarantine regulatory measures are

operative through the "Destructive insect and pest act, 1914" to prevent the introduction and spread of insect, pest and disease of crops. The central government operates the domestic quarantine regulations through powers vested under section 4A, B & D and section 5, which authorize the state government to enact similar regulations and section 5A provides for the penalties. The first domestic quarantine notification was issued by central, government in 1944 against Fluted scale, San Jose scale in 1953, banana bunchy top virus disease in 1951, potato wart in 1959 and apple scab in 1977 (Anonymous, 1980).

Plant quarantine measures aim at providing protection to the agriculture of a country or region from the foreign pests/pathogens introduction and establishment. These protection measures are very important and in relevance to countries like India, whose economy is largely based on agriculture. The success of plant quarantine measure depends on the proper composition of the state service for plant quarantine, the scientific background and quantification of insects and specialists, availability of technical equipment and quarantine statics and laboratories.

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Table 1: List of pests covered under domestic quarantine regulations

Pest/disease	Host plant material	Restricted		Requirements
		From	To	
Fluted Scale	Many host plant species	Mysore, Chennai, Kerala	To any other state or place	Transport of the host plant material of this pest is permitted only with a certificate of freedom issued by the Director of Agriculture of states.
San Jose Scale	Many host plant species	Punjab, UP, Chennai, WB, Assam, Orissa, HP, Jammu & Kashmir	To any other state or place	Movement of propagating plant material is prohibited except by a certificate issued by authorized Entomologist/ Plant pathologist of State.
Banana bunchy top (virus)	Banana planting material	Assam, Kerala, Orissa, Tamil Nadu & West Bengal	Any other State	Complete prohibition of transport of banana planting material.
Banana mosaic (virus)	Banana plants	Maharashtra & Gujarat	Any other State	Complete prohibition of transport of banana plants & packing material
Potato Wart	Potato	West Bengal,	Any other State	Transport or export of potato tubers prohibited
Apple Scab	Apple planting material	Jammu & Kashmir, Himachal Pradesh	Any other State	Transport of planting material prohibited
Codling Moth	Apple & walnut	Ladakh District	J&K	Movement prohibited
Potato Cyst Nematodes	Potato	Tamil Nadu	Any other State	Movement of seed potato prohibited. Movement of table potato permitted if accompanied with special permit.
Coffee Berry Borer	Coffee seeds/plants /powder	Nilagiri, Kodagu & Wynad	Any other State	Movement of coffee seeds, plants & powder is prohibited except authorized certificate issued by the Director of Agriculture Kerala State or Chairman Coffee Board.

Source: http://phytosanitarysolutions.com

Ker (*Caper berry*): Useful Arid Region Plant

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The genus *Capparis* comprises approximately 250 species, including shrubs, trees and woody climbers. Reportedly, 26 species of this genus occur in India. Many variants of Capers are native to the Mediterranean basin in the west, parts of North Africa, and as far east as Central Asia. As a condiment, capers date back over 5,000 years. Ker (*Capparis decidua*) is one of the important multipurpose woody species of desert and arid regions and plays a significant role in the rural economy of peoples. It belongs to family Capparidaceae. It can be seen growing in the arid regions of India, Pakistan, Sudan, East and South Africa, Arabia *etc*. It is known by different names locally such as Karil in Uttar Pradesh, Kair in Rajasthan, Teent in Haryana, Ker in Gujarat, Della in Punjab and Nepti in western Maharashtra. In Rajasthan and Gujarat, the berry is a staple within the rural economies. It is an extremely hardy species and provides vegetative cover in hot, sandy desert areas where little else grows. Ker tree offers shade and prevents soil erosion, feeds the locals, provides

building materials and medicinal remedies. The plant is a large, climbing, thorny and densely branched shrub or tree, up to 6 meters in height. It is having grey coloured rough bark. Young branches bear caduceus, linear and 1-2 cm long leaves. The flowers are red or pink in lateral corymbs and berries are globose or ovoid, 1-2 cm in diameter, dull red with a hard woody, 1-2 mm thick brownish rind (Anonymous, 2007). Ker has been used in traditional medicine for centuries. Indian tribes have utilized fruits, roots, and bark to cure various remedies. The plant is used in treating asthma, cough, toothache, arthritis, inflammation, malaria, intermittent fevers,

rheumatism, and swelling. In Ayurveda, ker are hepatic stimulants and have been used for arteriosclerosis, as a diuretic, and as a kidney disinfectant.

CULTIVATION

Kair can be found at the altitude range from 300-1200 m with mean annual rainfall of 100-750 mm and mean annual temperature of 25-41ºC. Although it is well suited to areas with low rainfall (150 mm), kair can survive in areas with rainfall as high as 600 mm. It prefers alkaline, sandy and gravel soils. In India, kair can be found in the dry regions. Kair can be grown readily from seeds and root suckers. Seed can also be sown and germinates readily. New plants can also be raised from cuttings. It is one of the hardiest plant not require ant care or maintenance. Sowing is best done during August. After six to seven months, the seedlings are ready for transplanting. Kair comes into fruit after 4-5 years of age. Ker shrubs bear fruit two to three times a year, from March through April, and again from May through July. The fruits should be harvested when green and tender at the "small pea" stage for pickling and use as a vegetable. The stage can be judged by the size of the fruits and also by pressing the berries. It is also suggested that the fruits should be harvested 7-10 days after fruit set, when they are 5-8 mm diameter, during March-April, to fetch a better price in the market. After maturity, the seeds harden and the fruits are not preferred for consumption. The fruits of the second flowering, available in September- October, are not usually harvested as the crop load is poor. Hand picking the fruits is a common practice for harvesting. By hand picking, only tender fruits are harvested and mature ones are avoided, hence there is no need for further grading of the fruits. Moreover, the plants are spiny in nature, thus careful harvesting is required. Fruit production increases as the plants get older. A 5-7-years-old bush of kair gives about 1-2 kg of green tender fruits. Though there is high variation in fruit yield and sometimes the old kair tree yield as high as 6-8 kg fruit per tree. The unripe/ripe fruits of kair are generally not eaten fresh due to their acrid taste, but can be processed into a variety of by-products. The pickles are the most commonly and widely utilized post harvest product. The processed fruits can be utilized directly as a vegetable or for preparation of pickles. It can also be dehydrated for off-season utilization. The processed fruits are stored either in pots or in plastic containers while processed dried fruits are stored in flexible polybags.

HEALTH BENEFITS OF KER

Aside from economic uses, kair is also tapped for its medicinal qualities. It is rich source of various phytochemicals possess medicinal value. Different chemical

compounds present in different plant parts are extracted and used to treat various illnesses (Table 1). The plant has a bad smell and taste; it is carminative, tonic, emmenagogue, aphrodisiac, alexipharmac, improves the appetite; good for rheumatism, lumbago, hiccough, cough and asthma. Ker was found to be the richest source of beta-carotene in fresh and various processed forms (Chaturvedi and Nagar, 2001). Pickled fruits treat constipation and other stomach ailments. A report titled *A Medicinal Potency of Capparis decidua* mentions additional uses: 'Capparidisine', a new alkaloid from *C. decidua* is reported to have dose dependent depressant effect on heart rate and coronary flow (Gupta and Ali, 1997).

FLOWERS

Pungent taste**,** useful in treating disorders such as neuralgia, paralysis, constipation, bloating *etc***.** and also diuretic and increase the volume of urine and feces.

Fruits

Fruits are rich source of nutritional elements (Table 2). The alcoholic extract of fruit pulp and root bark possesses anthelmintic activity and antidiabetic activity. The extract of unripe fruits and shoots of *C. decidua* produced reduction in plasma triglycerides, total lipids and phospholipids; hence used as hypocholesterolaemic. When pickled or cooked as vegetables, the immature fruits are used to cure stomach problems, especially constipation. The fruit has a sharp hot taste astringent to the bowels, destroys foul breath, biliousness and urinary purulent discharges good in cardiac troubles (Ayurveda). Fruit powder has hypoglycemic activity, decreases lipid peroxidation and alters free radical scavenging enzymes such as superoxide dismutase (SOD) and catalase (CAT) in erythrocytes, liver, kidney and heart in aged alloxan induced diabetic rats. *C. decidua* powder is used against alloxan induced oxidative stress and diabetes. The *Capparis decidua's* fruit contains dietary fiber foods like hemicellulose. It has the most pronounced hypocholesterolaemic effect which appeared to operate through increased fecal excretion of cholesterol as well as bile acids.

Seed- The edible fruits are rich in protein and minerals and have a high seed fat content. Seed contents 20% oil, 1.7% sugar and 8.6% protein. Seed oil contains nitrogen and sulphur. Seed powder is used to cure skin diseases.

Bark: It can be used in liver affections. An admixture of root and stem bark is used for diarrhoa and febrifuge treatment. Bark has an acrid, hot taste, analgesic, diaphoretic, akheteric, laxative, antihelminthic, good for cough and asthma, ulcers and boils, vomiting, piles and all inflammations. The

alcoholic extract of root bark possesses significant antibacterial and antifungal activities. Stem bark, meanwhile, is used for rheumatism and toothaches, including pyorrhea. The stem and root bark extracts contain isocodonocarpine, capparisine, and other alkaloids that are effective in curing the asthama, inflammation, diabetes and cough. The aqueous extracts of roots of *C. decidua* are found to have purgative activity. Tender shoots, when chewed, relieves toothache and bark is a good

remedy for ulcer, boils, vomiting and inflammations. Root bark is used against intermittent fever and rheumatism.

Also extracted juice from fresh plant is used to kill worms. Young shoots used as plasters for boils and swellings. Powdered plant parts are useful in toothache.

OTHER USES

1. Kair is of much use in climate prediction and features in farmers' strategies in natural resources production and management and agricultural planning. Peoples believe that if there is more flowering with deep pink colour signed raised temperature and occurrence of very less or no rainfall, which will form the base of next crop selection for the locals.

2. Fruits are rich source of proteins, vitamins and minerals. Ripened fruit can be eaten as raw. The flower buds and immature green fruits of kair are pickled, cooked and consumed as vegetables. Fruit pickle is very tasty and most processed product of this fruit. The fruits are also cooked as vegetables with the fruits of *Prosopis cineraria* and seeds of *Acacia senegal*. The air-dried processed and air-dried immature fruits are delicious and very expensive.

3. Farm animals like camel and goat prefer to eat kair fruits. Fruits are rich in carbohydrates and protein with high amount of potassium. Green or dried leaves of kair are used as diet supplement for goats, sheep, camels and other animals during periods of grass scarcity.

4. Kair wood is light yellow to pale brown in colour. It is moderately hard and heavy and resistant to termites. Each plant yields 625-775 kg/m^3 of wood. The wood's strength and durability also makes it suitable for making water pipes, water troughs, small beams and rafts, knees of boats, tool handles, cartwheels, axles, and even combs. It is also used for making huts and fences. Kair is generally used for charcoal and firewood. It possess better fuel wood properties

5. The seeds of *C. decidua* contain up to 20.3% high quality oil, which is edible when processed. This oil consists of 68.6% unsaturated fatty acids and 31.4% saturated fatty acids.

6. *Capparis decidua* can be used in landscape gardening, afforestation and

reforestation in semi desert and desert areas; it helps prevent soil erosion, particularly in controlling wind erosion in sandy areas, as well as reduction of alkalinity and increase in organic carbon and available N, P and K. Kair can also improve the fertility of sand dunes and has the tendency to reduce alkalinity very sharply.

7. Kair, being its dense canopy, it gives better shade to the animals during hot summer. As it is drought resistant and withstands neglect, the species can be particularly useful in arid areas as a live hedge, also providing edible fruits.

8. Kair is often found associated with religious rituals in North India. It is a custom for newly married couples and the newly born child to offer prayers in front of this plant. Singh and Singh, (2011)

Table 1. Major chemical compound present in Kair

Plant parts	Compound
Flower	n-pentacosane, n-triacontane , triacontanol β-sitosterol
Fruit husk	β-carotene,Phthalic acid
Seeds	Isothiocynate, Glucoside, Glucocapparin, n-pentacosane, n-tricontanol
Root bark	β- sitosterol, L-stachyhydine, Capparidisin, Capparisin, Capparissinin
Leaves-	Glucocapparin (Glucoside)
Root & Stem	Capparine, Capparilline, Capparinine, Capparidisine, Isocooncarpine (alkaloids)

Table 2. Nutritional value of Ker (In 100 g of Fruit)

Energy	41 kal
Protein	8.6 g
Carbohydrate	1.8 g
Fibre	12.3 g
Vitamin C	7.81 mg
Calcium	55 mg
Phosphorous	57 mg

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Solar powered drip irrigation system

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UTILIZATION OF SOLAR ENERGY

Gradually decreasing energy sources and increasing demand for water in recent years, made us to search for alternate non conventional sources together with efficient water management. Solar energy is the most abundant source of energy in the world. The new emerging technology replacing is solar energy which utilizes thermal energy available from collected sunlight and runs the system. This method is also helpful to the remote rural cultivable areas with no access to electricity. Solar power is not only an answer to today's energy crisis but also an environmental friendly form of energy. Photovoltaic (PV) generation is an efficient approach for using the solar energy. Solar panels are extensively used in many applications like solar heating, street lights and pumping water etc. One of the applications of this technology is used in irrigation systems for farming is solar operated drip irrigation system. Solar powered irrigation system can be a suitable alternative for farmers in the present state of energy crisis in India. In this system the solar energy is utilized to convert into electrical energy by solar panel, the battery gets charge though solar panel. Hence electrical energy is stored in it, from battery the pump started lifts the water to the storage tank so that whenever there is no electricity or in cloudy days or at night the farmer can do the irrigation

DRIP IRRIGATION

In areas of water scarcity drip irrigation became the efficient mechanism for delivering water (and fertilizer) directly to the roots of plants. Drip irrigation is a technique in which water flows through a filter into special drip pipes, with emitters located at different spacing. In solar operated drip system the solar panel will receive the solar radiation and converts the form in to electrical energy. This electrical energy is stored in the battery lifts the water to the storage tank. Due to gravity the water from storage tank will goes to the mainline and laterals.

Layout details

1. Solar photo voltaic system (SPV)

SPV is a power system used to supply usable solar power by means of PHOTOVOLTAIC'S. The smallest element of PV panel is solar cell. Solar panels or

modules are composed of number of solar cells to supply usable power. Most solar panels, or modules, generate direct current (DC) electricity. A group of modules is called an array. Photovoltaic (PV) is a method of converting solar energy into direct current electricity using semiconducting materials (Mono/Multi crystalline silicon cells). When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the material to produce electricity. This process of converting light (photons) to electricity (voltage) is called the "photovoltaic effect". The power developed by solar array ranges from 80 to 120 watts/sq.m area of panel.

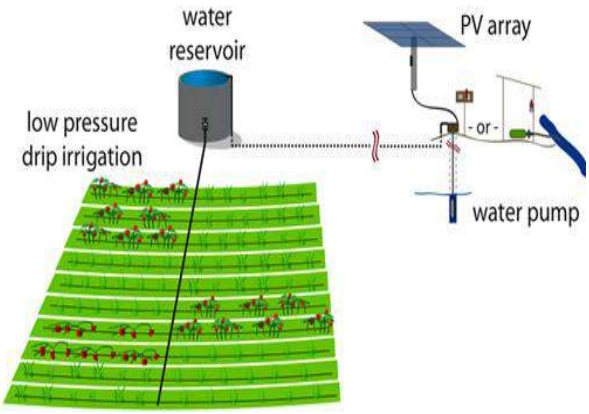

Fig1. Layout of solar operated drip irrigation system

2. Pump

Centrifugal or submersible pumps are connected directly to the solar array using DC power produced by the solar panels. Solar pumps are available in several capacities depending upon the requirement of water.

3. Controller

The pump controller protects the pump from high- or low-voltage conditions and maximizes the amount of water pumped in less than ideal light conditions.

4. Head control unit

Head control unit consists of Filters, fertilizer equipment, air release valve, non-return and control valves.

Filters: Filters are used to remove the dirt and impurities in the water to avoid blockage of drippers or emitters. Different types of filters are used on the basis of impurities present in water used for irrigation.

Fertigation equipment: In drip irrigation fertilizers can be applied along with water directly to crop at the root zone. This process is called as fertigation and can be aided by using special equipment like differential pressure tank or venturi. Due to simplicity of operation and low cost, venture is most commonly used in the field.

Valves: Non Return Valve allows the flow of water in only one direction. It prevents the return of water into the water source when pump is switched off. Hence, avoids the damage of pump or motor and also prevents mixing of fertilizer treated water into the water source. Air Release valve is provided to release the air present in the system, when the pump is switched on, otherwise system may damage due to heavy pressure.

5. Main and Sub main

Main and sub-main lines are usually buried and is made of PVC

6. Laterals

Lateral pipes are made of LLDPE/LDPE. These are used to carry water from sub main and supply to drippers/ emitters. Generally these are available in 12, 16 or 20 mm sizes.

7. Emitters/ Drippers

Water enters the dripper emitters at approximately 1.0 bar and is delivered at

zero pressure in the form of continuous droplets at low rates of 1.0–24 litres/h.

ADVANTAGES

1. Solar power makes possible to grow in dry regions
2. Less requirement of man power to operate the system
3. Reduces the dependence on conventional energy sources
4. No power and/or fuel cost to operate pump/drip system.

LIMITATIONS

- ✓ Low yield: Solar pumping is not suitable where the requirement is very high. The maximum capacity available with solar is very low. However, the output of the solar DC pump is more than a normal pump.
- ✓ Variable yield: The water yield of the solar pump changes according to the sunlight. It is highest around noon and least in the early morning and evening. So it should be operate during noon time.
- ✓ Theft: Theft of solar panels can be a problem in some areas. So the farmers need to take necessary precautions. Ideally, the solar system should insured against theft as well as natural hazards like lightning. It should be avoided by keeping fencing around it.

CONCLUSION

Although the conglomeration of solar pump with drip irrigation is environment friendly and energy efficient but the initial investment for Solar powered system is high.

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