

## DEVELOPING SEABUCKTHORN AS LIVELIHOOD SOURCE IN UNTAPPED MOUNTAIN ECOLOGIES OF PAKISTAN

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### Abstract

Seabuckthorn is a bushy plant growing in mountainous areas of Pakistan. It naturally grows in 30 countries of Europe and Asia. Seabuckthorn a multipurpose plant, has been historically used for its medicinal value especially in China and Tibet. A methodical approach was invented in Pakistan with the support of International Centre for Integrated Mountain Development (ICIMOD) and International Centre for Research and Training on Seabuckthorn (ICRTS) to use seabuckthorn natural resource for producing high value products with the objective of economic empowerment of local communities and to enhance ecological conservation. Policy wins through aggressive advocacy and community participation as well as networking of various stakeholders emerged mandatory for developing seabuckthorn as livelihood source in resource poor mountain communities. The informal spiritual institutions were found to have very high potential for social mobilization to involve communities in research and development.

**Key Words:** Seabuckthorn, high value products, community participation, securing livelihoods.

### Introduction

Seabuckthorn (*Hippophae* spp.) is a bushy plant, which may grow as a tree under the ambient temperature range of  $-43^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  (Rongsen, 1992). The uses and benefits of seabuckthorn as reported by Rongsen (1992) include forage for livestock, wildlife, etc since its leaves are highly palatable forage with high protein contents, which range from 11.47 to 22.92% (Singh *et al.*, 2002). In addition, its dry berries are nutritionally rich feed during the winter season. Seabuckthorn forest produces 18 tons/ha/ five years of very high caloric value fuelwood. Seabuckthorn plants fix 180 kg of atmospheric N/ha/annum through the fungi called *Frankia*. About 200 bioactive substances present in seabuckthorn pulp and oil possess very high medicinal value against various diseases (Schroeder and Yao, 1997; Rongsen, 1992; Zhang *et al.*, 1988, Pentegova, 1983).

Seabuckthorn could be very crucial in creating environmental balance in marginal and fragile ecosystems and enhancing productive land uses due to its exceptionally strong root network which would reduce >90% soil erosion even on steeper slopes and would also contain >80% water run off (Rongsen, 1992). Hence, seabuckthorn contributes significantly towards sustainable agriculture through checking productive soil losses and enhancing ground water recharge. Conclusively, seabuckthorn, being a multipurpose biological weapon, could effectively be used to facilitate economic transformation for alleviating poverty among the local communities in untapped mountain

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ecologies of Pakistan such as northern mountainous belt of Hindu Kush-Himalayas (HKH) (Jasra and Khan, 2001; Shunguang and Min, 1996; Shunguang *et al.*, 1996).

### Global distribution and development history

Seabuckthorn is distributed throughout Europe and cold regions of Asia. At least 30 countries of the world possess natural forests of seabuckthorn (Rongsen, 1992). It is mostly found in cold temperate regions and its thermophilic features and hydrophilous nature determines its distribution (Rongsen, 1992, 1996). Seabuckthorn is widely distributed in China, Mangolia and former USSR where thousands of hectares of natural as well as planted forests are found. It grows abundantly in the mountain areas of HKH and Qinghai Tibetan Plateau which are main areas of its distribution and origin of this genus (Rongsen, 1991).

During 'Tang' dynasty (618-907 AD), the medicinal properties of seabuckthorn fruit and leaves were discovered by traditional Tibetan doctors (Singh and Khosla, 2002). The products of seabuckthorn were used in the diet of Russian astronauts and as a cream for protection from cosmic radiation (Rongsen, 1996). In 1966, the Ministry of Health of the former USSR approved seabuckthorn oil for clinical uses in hospitals. In Nepal, the local people historically have been making a product from seabuckthorn called 'Chuk'. Chuk is used as medicine for pain, blood pressure, etc. and also as an additive. In China, seabuckthorn research and large scale plantation had started in 1980's where 0.3 million hectares were planted. Around 150 processing factories are presently producing more than 200 products from seabuckthorn in China (Rongsen, 1992).

### Scope and scale in Pakistan

The natural habitat of seabuckthorn in Pakistan is northern mountains of HKH belt (i.e. Northern Areas and Chitral). The area is situated between longitude 62-76° east and latitude 34-36.5° north. Its habitat is characterized by mountain landscape, high peaks, deep gorges interspersed with narrow valleys, steep slopes, bare rocks, glacial moraines and river terraces (PARC, 1984). The climate becomes temperate at higher altitudes in these areas. Annual precipitation varies from 300 cm in the southern part to 150 cm in the northern part where winter precipitation is mostly in the form of snow above an elevation of 1600m (PARC, 1984). Due to difficult topographic conditions, most existing roads are dangerous and risky because of rough surface, narrow with poor grades and sharp curves.

About one million people live in Northern Areas (NAs') of Pakistan and majority is engaged in subsistence agriculture (ICIMOD, 2000), Poverty and illiteracy are the main features of local communities. In southern part of NAs', agriculture provides only 50% of the family income. Communities are heavily dependent on community forests to meet their livelihood needs (Bashir, 2002).

In all main valleys of Northern Pakistan, *Hippophae rhamnoides* sub-spp. *turkestanica* is found at an altitude of 1500 to 3500 m with more dense stands at an altitude of 2200 to 2200 m (Rongsen, 1996). Northern Pakistan is centre of this sub species of seabuckthorn and this is the only sub species which can resist the harsh

climatic conditions of arid and hot summer and cold winter. There are a number of ecotypes of the subspecies occurring in various ecological zones in northern Pakistan in terms of size of plant, colour of fruit, thorns, etc. where most natural seabuckthorn stands are found along the river banks, water channels and alluvial fans with small water streams. The main distribution locations in NAs' as reported by Rongsen, 1996 were Gilgit valley, Hunza valley, Shigar valley and Astore valley. In Chitral, seabuckthorn was found in Chitral valley, Mastuj valley and Yarkhun valley. Seabuckthorn was also found in Swat valley near Gabral at 2400 m elevation.

Rongsen (1996) estimated that seabuckthorn is found over an area of three thousand hectares in Pakistan. However, recent estimates by Khan (2005) indicated more than ten thousands hectares of seabuckthorn natural forest in northern mountains of Pakistan. Yield of seabuckthorn berries has been estimated as about 400 to 750 kg per hectare, hence, promising a total annual yield of 1200 to 2250 tons (Rongsen, 1996). However, recent berry production estimates would fluctuate between 4000 to 7500 tons (Khan, 2005). Seabuckthorn fruit processing factories in northern mountains were proposed to enable the mountain poor for fighting against poverty (Rongsen *et al.*, 1997).

## Methodology

### Methodical Approaches

A methodical approach wheel (Fig.1) was designed during 1996 through 2005 for seabuckthorn development in Pakistan. Following approaches were used for initiating seabuckthorn development and for shifting to next stage of development;

- a) **Top down approach** (Fig.2): The top most office of the Government i.e. the Presidency was targeted for sensitization and hence, to get initiated seabuckthorn development in Pakistan.
- b) **Partner approach** (Fig.3): As soon as a seabuckthorn development project was approved, it was realized that a close networking of all seabuckthorn development partners was mandatory to win multidimensional breakthroughs. Eventually private and public sector wings were attached for exploiting seabuckthorn primarily as a sustainable economic proposition in association with conservation objectives. Participation of mountain communities in seabuckthorn development was ensured through partnerships with Non-Governmental Organizations (NGO's).
- c) **Mobilization approach** (Fig.4): While considering the sustainability of seabuckthorn development process, various partners were mobilized to become self operating development models requiring no more need to be catalyzed by the enzymatic role of seabuckthorn development project.
- d) **Sharp focus approach** (Fig.5): While reviewing the spade work under the seabuckthorn development project, the Ministry of Food, Agriculture and Livestock (MINFAL) decided to focus sharply only on natural habitats of seabuckthorn in Northern Areas, and to use seabuckthorn for economic

empowerment of local communities by involving local research based interventions.

- e) **Livelihood tree approach** (Fig.6): This approach focused on diversified high value cottage level seabuckthorn products preparation. Hence seabuckthorn became a year round economic activity.
- f) **Base approach** (Fig.7): Eventually a strategic seabuckthorn development by establishing at least three bases (i.e. Resource base, Institutional base and Commercial base) is being planned.

## Results and Discussion

Historically, the local farmers have been clinging to a traditional subsistence approach towards seabuckthorn. Sheep and goats depend considerably on seabuckthorn green leaves as browsing material with high protein value (i.e. 11.47 to 22.92%) during summer and its dry berries are rich energy source for them in winter (Rongsen, 1996). Seabuckthorn firewood is considered one of the best among all available resources due to its high caloric value. In many areas, local people based on their indigenous knowledge, keep their crop fields under seabuckthorn bushes for several years with a trust of higher crop yields. Now research has revealed that seabuckthorn plants fix Nitrogen @ 180 kg/ha/annum by a fungi called *Frankia* (Rongsen, 1996). Thorny twigs are commonly used as fence around orchards, crops, etc. and the trunk and larger branch wood has various local timber uses.

Traditional medicinal uses of seabuckthorn fruit are based on the presence of about 200 bio-active substances in its oil and pulp (Rongsen, 1996, Yaonian *et al.*, 1996, Koshelev *et al.*, 1996, Xiaoping *et al.*, 1996).

## Constraints and Initiatives

Seabuckthorn was initially confined within the traditional perch and subsistence taboo besides its ecological distribution at higher altitudes, hence, inflicting difficult approach and access. Until 1995, ecological as well as economic potentials of seabuckthorn were unknown to the policy makers and down to community level (Fig.2). ICIMOD handed over the seabuckthorn technology packages to an articulate policy maker of the Government of Pakistan (GOP) who presented it before the President of Pakistan. Hence, clear instructions were passed down for swift actions to exploit seabuckthorn potential in Pakistan. ICIMOD again stepped forward by arranging a visit of a high level Pakistani mission to China for studying seabuckthorn development models there and by hiring a Chinese consultant who prepared a feasibility report for developing seabuckthorn in Pakistan. Eventually a seabuckthorn development project (Rs.28.0 million) was approved by the GOP by the end of 1996.

## Seabuckthorn Development

The implementation of seabuckthorn development project was deferred for a couple of years as a consequence of reshuffling at policy level. In 1998-99, seabuckthorn

regained policy support and the project was activated under the Ministry of Food, Agriculture and Livestock (MINFAL), with two parallel goals of poverty alleviation and ecological conservation. Its scope and scale ranged between the mountains in the north to sea beaches of Balochistan in the south.

### ***Partners and stakeholders***

A partner approach (Fig.3) for developing seabuckthorn was envisaged. A trustful public-private partnership, a missing dimension in governmental development project, was established. A persistent international support from the International Centre for Integrated Mountain Development (ICIMOD) Nepal and International Centre for Research and Training on Seabuckthorn (ICRTS) China was key to our success in Pakistan. Initially, both public and private partners were chosen with precise objectives of social mobilization, market oriented high value cottage & medicinal products development, and seabuckthorn resource expansion over marginal lands. However, welcome to new partners and networking among partners is a recognized regular feature of seabuckthorn development process to secure livelihoods in northern mountains of Pakistan. Our approach is inline with Anil and Kerkhoff (2004).

Within four years, seabuckthorn development attained its second stage (Fig.4) when at least four self operating models were being operated. Among these, the spiritual mobilization model was the most interesting one. Because by sensitizing and mobilizing one individual i.e. spiritual leader (Syed Deedar Hussain Shah), his over half a million followers were our trust worthy development partners (Gardezi Chisti Sabri, 2005). This substantive experience asks for strategic involvement of spiritual personalities of all religions to enable rural poor to come out of poverty. A spiritual leader should be viewed as an institution whose spiritualized followers believe in blind and swift compliance. As a matter of fact, the Aga Khan Rural Support Program (AKRSP) is the formal and modern version of spiritual mobilization, and is currently considered as the most successful model for poverty alleviation among mountain poor.

### ***Community Participation***

Resource poor mountain communities were the ultimate stakeholders of seabuckthorn development in Pakistan. Hence, need of NGO's for social organization and community participation was recognized during very early stage of development. Eventually, AKRSP became the first partner of seabuckthorn development project, followed by Syed Deedar Hussain Shah, the spiritual model (Gardezi Chisti Sabri, 2005) and PSI, the community based entrepreneur (Pak Seabuckthorn International, 2005). AKRSP involved communities in all seabuckthorn berry and root-shoot collection from wild seabuckthorn plantations for project activities. Syed Deedar Hussain Shah, the spiritual model, engaged his follower community in seabuckthorn nursery operations by establishing quite a few nurseries at farmers fields with the technical support of project. Farmers were trained in various nursery operations and seedlings produced by them were sold to Forest Departments for field plantations through project. PSI emerged in later stages under project initiatives as an exit strategy with a very specific objective of enabling local communities to produce and market quality seabuckthorn cottage products and to ensure sustainability of project investment in seabuckthorn development.

***Seabuckthorn – a livelihood source***

In 2002, as a policy decision, the seabuckthorn development was given a turn to focus sharply on its natural habitat in NAs'. The objective was to create local technology and knowledge base, so that the development may proceed on the foot steps of localized research findings (Fig.5). Hence, the dense natural seabuckthorn stands would become accessible with appropriate male/female ratio of plants to enhance yield and berry harvest. Eventually, it would give a momentum to economic activity to secure rural livelihoods. Since then our knowledge base is knurling particularly for smooth policy decisions and gender sensitivity. We consider it as stage three of seabuckthorn development in Pakistan.

From very first day, the development strategy was based on promoting market oriented high value addition of seabuckthorn. For this purpose, a strategic decision was taken and the project started buying seabuckthorn dry berries @ Rs.100 per kg from local communities by involving AKRSP in 1998-99. It was like an economic miracle for the local poor (Pak Seabuckthorn International, 2005). Tons of dry berries were purchased which were later used for oil extraction and aerial seeding over juniper forests in Balochistan province. Meanwhile our media campaign for all types of our stakeholders remained aggressive and well targeted. Seabuckthorn was presented as wonder plant for economic transformation and environmental rehabilitation by using knowledge base from ICIMOD and ICRTS. Next year i.e. 1999-2000, another commercial blast was exploded to boost up the economic value of seabuckthorn by purchasing tons of fresh berries @ Rs.50 per kg for cottage product line development and thousands of root-shoot plants for spring plantation in Balochistan, AJK and Pothwar region. Eventually, purchase of dry berries and fresh berries from local farmers of NAs' became regular annual activity of the project to gain the marketing trust of local communities (Pak Seabuckthorn International, 2005). In this regard, AKRSP, Pak Seabuckthorn International and Syed Deedar Hussain Shah – the Spiritual Model remained our key and trust worthy partners for social mobilization as well as seabuckthorn development.

While carefully synthesizing the on-going scenario, the communities were hooked up with a private partner who was mobilized to exports seabuckthorn seed (Pak Seabuckthorn International, 2005). The project mediated successfully between communities and the exporter for a price tag to per kg of dry seabuckthorn berries. Meanwhile, the livelihood tree approach (Fig.6) was incorporated to develop seabuckthorn as livelihood source for resource poor communities. PCSIR was mobilized to develop seabuckthorn product line. PCSIR did emerge as an enthusiastic partner by opening up the doors of its laboratories at Skardu and Peshawar exclusively for seabuckthorn cottage product preparation as well as training of local farmers. Simultaneously, the NCT and its associated pharmaceuticals and indigenous medicine practitioners called "*Hakeems*" were invited to explore the medicinal uses of seabuckthorn. While keeping in view the success stories in China and former USSR, the dismaying traditional institution valued seabuckthorn as *savoir faire* and wasted no time to introduce new seabuckthorn medicinal products for clinical trials. By 2001, the seabuckthorn development achieved another milestone when the spiritual seabuckthorn model (Fig.4) started sale of its nursery plants to public departments and sale of seabuckthorn oil of its own crushing unit to public for medicinal uses (Gardezi Chisti

Sabri, 2005). By then, the seabuckthorn project management became articulate to continuously build up the capacity of its partners and to establish need based linkages among all stakeholders. Finally as an exit strategy, an institution i.e. Pak Seabuckthorn International (Fig.4) at community level was created by 2002 and most stakeholders were linked to it as a sustainable seabuckthorn marketing network.

In the beginning of 2002, our development partners mainly PCSIR and NCT had developed >30 seabuckthorn products (i.e. food, cosmetics, medicines etc.). By the end of 2004, the project picked up 16 products of high market value and in this regard, had already trained more than one thousand representatives mostly woman of local communities. Sale outlets for products were established. The seabuckthorn business ratcheting was encouraging in 2004. The value of annual berry trade was estimated as Rs.3.4 million along with buying and selling of products worth Rs.0.58 million (Khan, 2005).

### ***Role in agricultural sustainability***

Livelihood of majority people in Northern mountains of Pakistan depends on livestock and its products i.e. up to 70% (Mustafa *et al.*, 2005). Seabuckthorn is a major source of green palatable forage for livestock in summer i.e. protein rich leaves with about 20% crude protein. Its dry berries are also high energy feed supplement in winter (Rongsen, 1991). It is also used as biological fence to protect orchards and crop fields from trespassing when planted on boundaries. Seabuckthorn has very extensive and strong root system which not only checks soil erosion on highly fragile sloppy soils but also improves soil fertility by its nitrogen fixing property (Rongsen, 1992). One of the local traditional practices is to plant seabuckthorn on very poor soil for a few years. Eventually the uprooted seabuckthorn is an excellent fuel wood and the cleared site becomes productive for crop cultivation (Rongsen, 1996).

Our seabuckthorn development package also included supply of improved seed of suitable wheat varieties to farmers on no profit no loss basis as well as free of cost breeding bulls of Holstein Frisian cattle and breeding bucks of Angora goats. It did catalyze the seabuckthorn development process and improved simultaneously wheat yields many times. Impact of livestock based interventions would take little longer to become visible however, farmers were quite excited. Coherently, seabuckthorn is sustaining the indigenous agricultural production systems. Conclusively a science based modern development of seabuckthorn would not only improve the productivity of local production systems but would ensure the sustainability of highly productive irrigated low lands of Punjab and Sindh provinces where millions of tons of annual sedimentation load from upper watersheds is reducing the capacity of water reservoirs and is causing flash floods to damage thousands of hectares of standing crops in monsoon. With this realization, Mountain Area Conservancy Project (MACP), and the World Conservation Union (IUCN) initiative, has been recommended to incorporate seabuckthorn plantations in its project activities.

### ***Strategic bases***

The policy makers of Pakistan are now convinced that the wild bush of seabuckthorn would emerge as potential source of livelihood and should be exploited as a weapon to handle at least following two social issues. a) Down hill winter migrations would be halted since all seabuckthorn berry harvest activities continue throughout winter. b) Hence, seabuckthorn is creating localized employment opportunities (Pak Seabuckthorn International, 2005) so would be helpful in checking the out migrations of male family members for off-farm employment opportunities. Additionally, the wild seabuckthorn bush has professed to a status of staunch livelihood demanding no annual or periodic cash inputs, thus, unlike past, it is well protected by the owners allowing under storey vegetal cover to expand and diversify yet promoting biological richness to pacify environmentalists. The change should be visible and quantifiable during the next decade to come.

Conclusively, a policy decision has been taken to establish seabuckthorn based three strategic bases (Fig.7) to secure livelihoods of mountain communities residing at high altitudes. It may be called as proposed stage four of seabuckthorn development in Pakistan. The proposed strategic bases would be; a) Institutional base where a Seabuckthorn Research and Development Institute (SRDI) would be established in NAs' with an objective of developing and managing knowledge bank for all stakeholders i.e. from policy to community levels. b) The second proposed base is the resource base. The focus would be on converting 3 to 7 thousand ha of natural seabuckthorn stands into managed seabuckthorn orchards with appropriate male: female plant ratio for optimum berry yield and harvest. Gradually, this base would be expanded by field plantations of improved ecotypes/cultivars. c) The commercial base would convert the raw material of resource base into high value market products of national as well as international demand. These bases would take us to ultimate destination i.e. strategic seabuckthorn compounds (Fig.8) for securing livelihoods in northern mountains.

### **Conclusions**

Seabuckthorn development in Pakistan for securing livelihoods of poorest of the poor in HKH mountains is now a success story. It may be translated as strategic development tips for multiple interests.

- a) Top down approach works miraculously faster whenever the opportunity is availed in an articulate manner with a simultaneous sensitizations of all policy hierarchics.
- b) The pixie spiritual individuals are currently operating as informal institutions. They may be involved in development process as formal community based institutions with huge and brisk social mobilization potential.
- c) For value addition of any commodity, innovative and controlled 'commercial blasts' followed by private and public partnerships and confidence building networking would eventually lead to a remarkable market success.

Fig. 1. Methodical Approach Wheel for Seabuckthorn Development in Pakistan

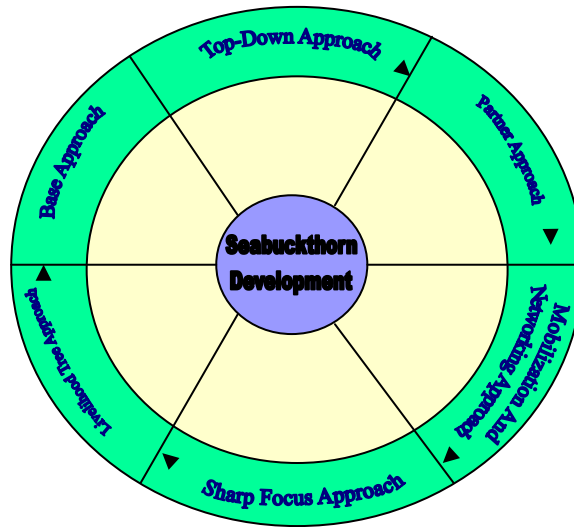


Fig.2. Initial stage of seabuckthorn development in Pakistan

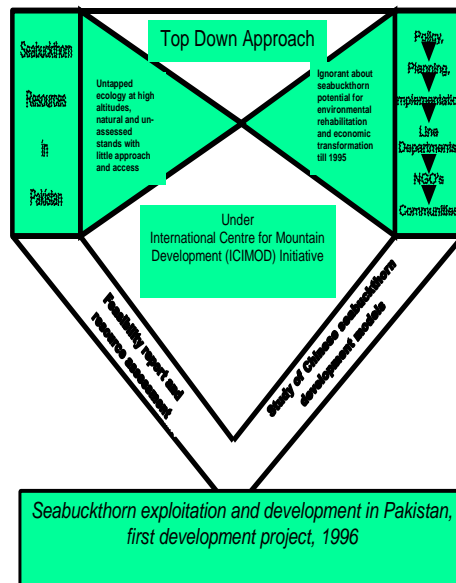


Fig.3. Seabuckthorn Development Partners in Pakistan – a Partner Approach

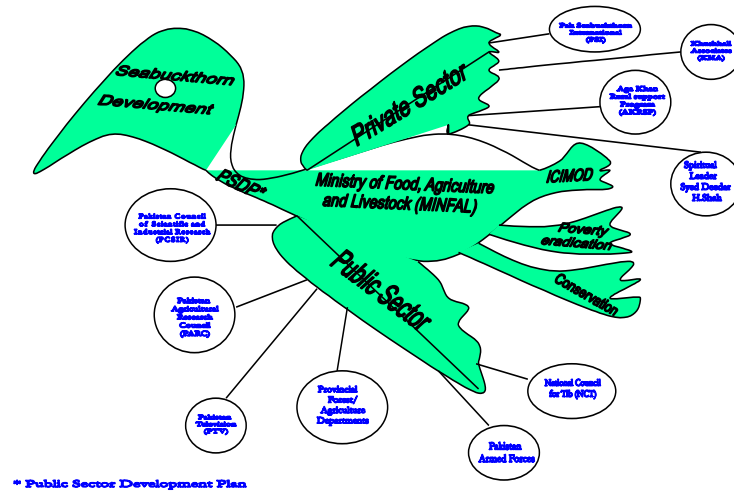


Fig.4. Second Stage - self operating seabuckthorn development models in Pakistan

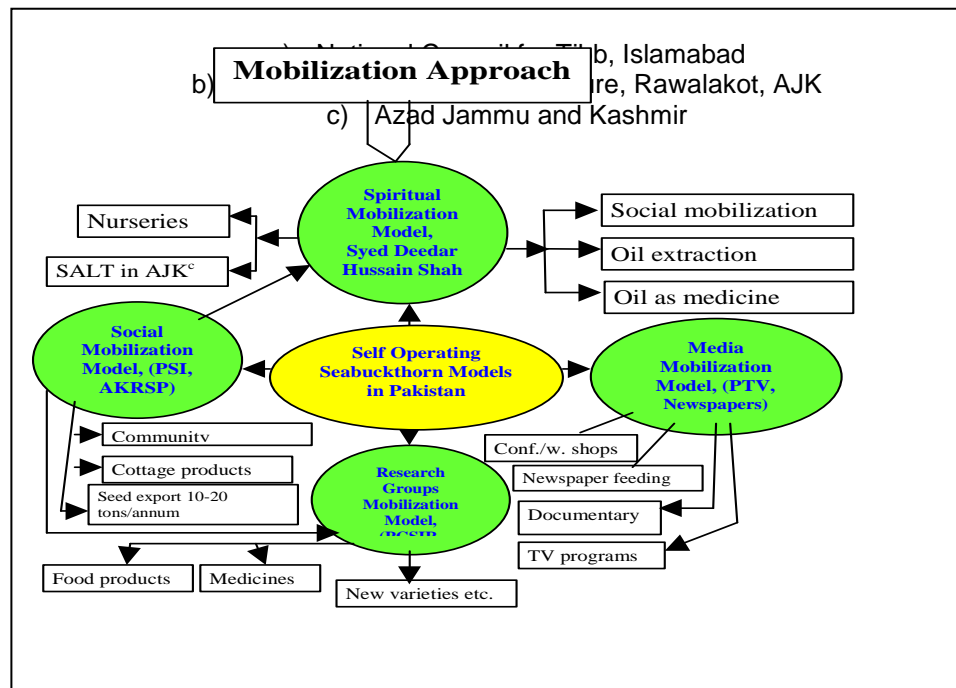


Fig.5. Stage three of Seabuckthorn Development in Pakistan Sharp Focus Approach

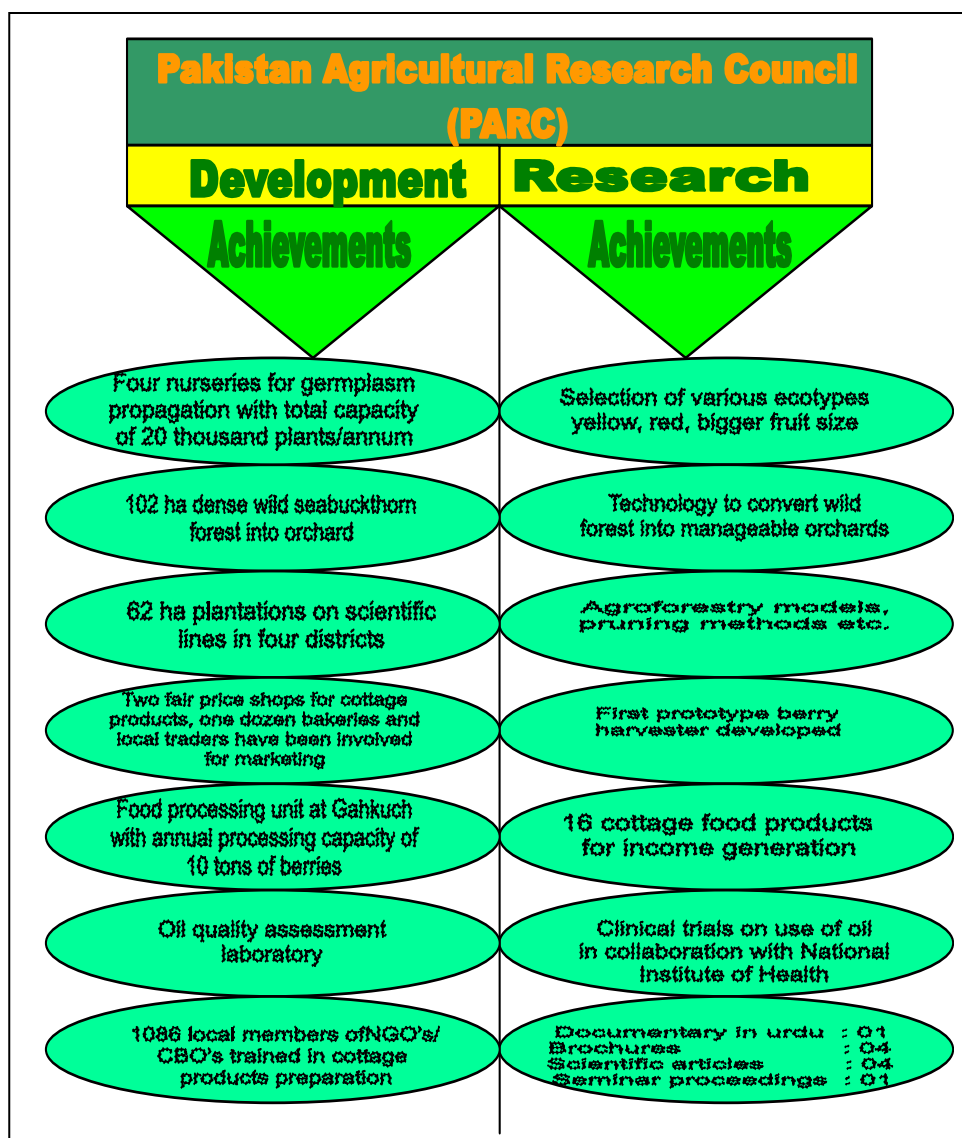


Fig.6. Livelihood Tree Approach - Seabuckthorn emerging as livelihood source in Northern Areas of Pakistan (Pak Rs.60 = One US\$)

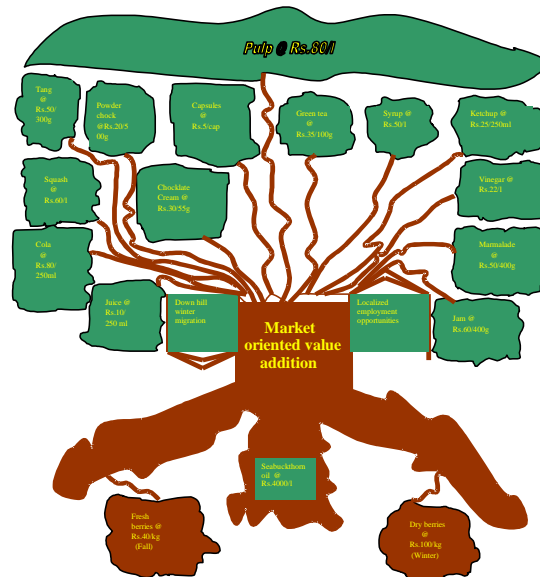


Fig.7. Stage four – Proposed Strategic Seabuckthorn Development in Pakistan

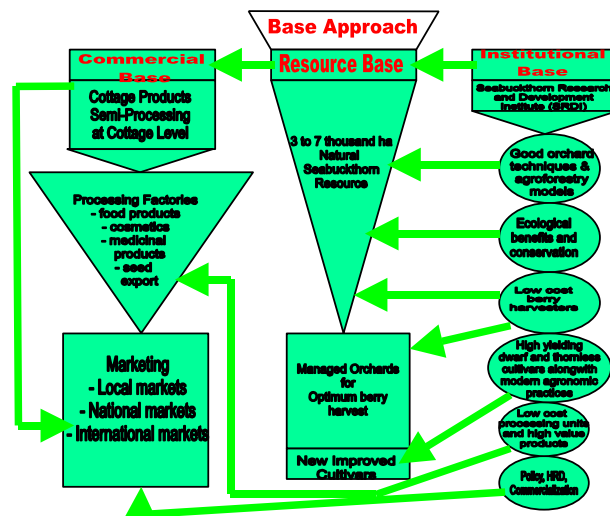
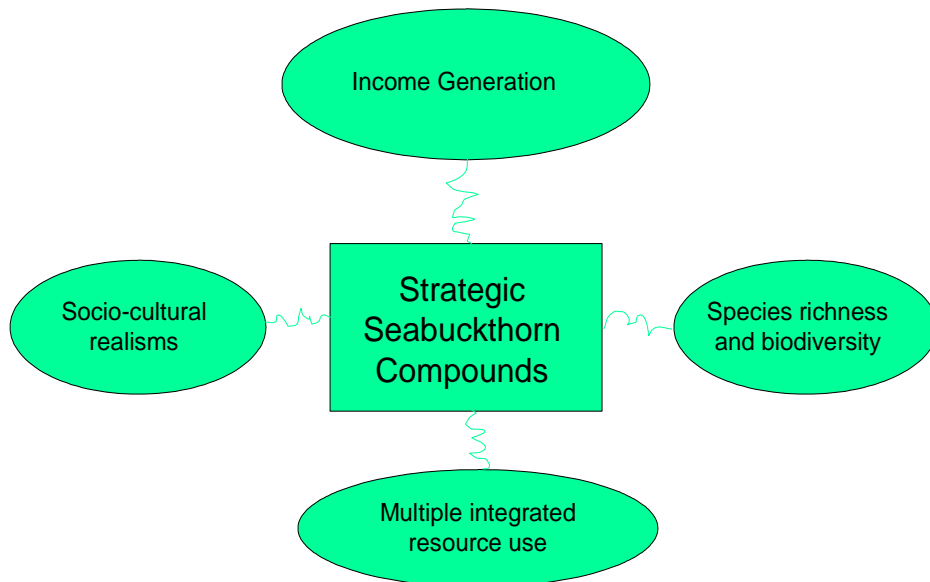


Fig.8. Seabuckthorn Compounds For Securing Livelihoods – An Ultimate Destination



- d) A successful exit strategy should include establishment of self operating models for sustainable development impact. At least one of these models should be pivotal with very strong commercial interest to oscillate among others.
- e) The development process must take support of local innovations leading to a well managed knowledge base accessible by all kinds of stakeholders.

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