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DIPLOMA THESIS

**Sustainable agriculture and its perceptions amongst Czech
and Indian students**

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Declaration

I hereby declare that I have worked on my diploma thesis titled “Sustainable agriculture and its perceptions amongst Czech and Indian students” on my own, based on the sources mentioned at the end of the thesis and with help given to me by people mentioned in the acknowledgements.

In Prague on 8th April, 2011

Andrea Poláková

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**Udržitelné zemědělství a jeho percepce mezi českými
a indickými studenty**

**Sustainable agriculture and its perceptions amongst
Czech and Indian students**

Souhrn

Zemědělská činnost zajišťuje základní životní potřeby společnosti. Kromě produkce potravin a jiných zdrojů surovin, slouží zemědělství mnoha dalším účelům, které se vztahují k celé škále společenských, ekonomických a ekologických funkcí, které jsou se zemědělstvím a užíváním půdy neoddělitelně spjaty. Ocenění tzv. multifunkčního zemědělství je důležitý krok k udržitelnému zemědělství, které je podmínkou pro udržitelný rozvoj.

Tato práce zkoumá udržitelný rozvoj s hlavním zaměřením na udržitelné zemědělství, a jeho percepce ve dvou odlišných státech světa; v České Republice a v Indii. Percepce závisí na ekonomických, společenských a ekologických podmínkách dané země. Z výzkumu vyplývá, že indické a české percepce se liší s ohledem na tyto rozdílné podmínky v těchto státech.

Klíčová slova:

zemědělství, multifunkční zemědělství, udržitelný rozvoj, udržitelné zemědělství, percepce, Indie, Česká Republika

Summary

Agriculture has a vital function in meeting the basic needs of human society. Besides production of food and other products, agriculture serves many other purposes that refer to a whole range of social, economic, and environmental functions associated with agriculture and related land-use. The acknowledgment of multifunctional agriculture is an important step towards sustainable agriculture, which is a premise for sustainable development.

This work investigates sustainable development with its main focus on sustainable agriculture, and how it is perceived in two different countries: the Czech Republic and India. Perceptions may be determined by economic, social, and ecological conditions in each country. It appears from the research that Indian and Czech perceptions differ with respect to the different conditions and different roles that agriculture plays in these two countries.

Key words:

agriculture, multifunctional agriculture, sustainable development, sustainable agriculture, perceptions, India, the Czech Republic

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1. Introduction

The face of our planet is changing. Human civilization has achieved great technical progress. Information spreads as quickly as a thought all over the world. Man has elevated him/herself to the role of creator and is able, among other things, to change heredity of organisms. How far can this go? We have separated ourselves from nature and have created our own forms in order to fulfill ourselves. We have forgotten all things are interconnected. As in organism, every single cell has its unique function, otherwise the system would collapse. A cancer cell turns away from its role in a body and develops its own unhealthy existence – a tumor. Finally, the whole organism dies, and so does the cancer cell.

Creating should go hand in hand with responsibility and through awareness of the linkages within any system. Every action has an impact on the planet's ecosystems, from the local to the global, and the world is changing rapidly. These rapid physical changes, taken together with a rising human population level, are, when projected into the future, rather alarming and depressing. It takes the planet 18 months to replenish the amount of resources we use in one year. In other words, at our current rate of consumption, humanity needs 1.5 Earths to be sustainable (Bittman, 2011). People have been exhausting natural resources in such a way and to such an extent that our own existence is now endangered. With increasing pressure on energy resources and raw materials, civilization is currently facing significant challenges to ensure planetary survival. The creative power of humanity needs to be guided towards sustaining existence on Earth, for the wellbeing of all.

It is no longer feasible to look only to maximizing short-term profits without taking into account its impacts on our environment and society. The interconnectedness of the planet's systems is getting more and more obvious. It is crucial to find ways optimize the balance between the three interrelated dimensions of sustainability– environmental, social, and economic. Any society which does not care about ecology is inherently drawing to a collapse. The laws of nature must take priority over the actions taken by man.

The main premise for sustaining life on the planet is sustainable agriculture which is perhaps the most outstanding issue and challenge for sustainability. Agriculture directly or

indirectly impacts on every life by not only providing essential food, feed, fiber, and raw materials. Its other functions, which include environment management and preservation, the support of both the economies and cultures in rural areas, and a contribution to the stability of society – but these benefits are often not given credit in the market place. The recognition of the multiple functions of agriculture - so-called “multifunctional agriculture” - in international trade policies is an essential step towards sustainable development.

For sustainable development is very important how it is perceived by people. It is into notable extent dependent on human values, physical conditions, culture, traditions, customs, faith, education, ethics, and experience. These factors vary from country to country, as do perceptions about sustainable development and agriculture. The term “perceptions” includes the higher elements of rational cognition. The dependence of both perceptions and understanding on human values and general social factors should be emphasized. Man is strongly influenced in his perceptions not only by his own experience but also by the experience of society as a whole. The perception is then given by social patterns (Librová, 1987).

This thesis focuses on perceptions of sustainable agriculture by students; those who may in the future have influence and power, who will have to deal with challenges that up-to-date development brings, and who will decide on the direction of further development. The research is focused on two very different parts of the world; India and the Czech Republic.

2. Objectives of Thesis and Methodology

Objectives

The research has been focused on students in India and in the Czech Republic. Education is a decisive factor in the development of agriculture and for development in general. Students will possibly take over influential positions and will have to deal with more and more pressing sustainability issues.

The main goal is to investigate how the concept of sustainability and in particular sustainable agriculture with respect to the main three pillars of sustainability - environmental, social, and economic - is perceived by these students and what possible differences in attitudes can be shaped from the different responses of these two respondent groups.

The questions were designed to bring out general perceptions about different aspects of the concept of sustainable development. This work does not aspire to study in details the different backgrounds of Czech and Indian people. The interpretation of the findings is based on a review of selected literature on the topic of sustainable agriculture, as well as on interviews, and on the author's own experience.

Hypothesis

It is supposed that there are differences in perceptions about sustainable agriculture between Indian respondents and Czech respondents given the different economic, social and environmental conditions in each country.

Methodology

Theoretical section:

Documentary research: collection and elaboration of information from books, papers, case studies, interviews, seminars, discussions, and Internet articles focused on this topic.

Empirical section:

For the empirical section, a questionnaire survey was selected, as the main tool for investigating the perceptions of sustainable agriculture by Czech and Indian students.

The questionnaire consists of questions focused on all three dimensions of sustainability – environmental, social, and economic. The questions touch on three related areas: agriculture and its importance, sustainable development, and sustainable agriculture.

The author assumes that perceptions about sustainable agriculture are dependent on values, attitudes, and beliefs, based on the social, economic, and environmental experience of the respondents. Thus many of the questions are formulated to uncover the values, attitudes and beliefs of both respondent groups. Conclusions are drawn based on the answers.

The questionnaires sent to both respondent groups were made using an on-line Google form. The data from the questionnaires were processed through the SPSS program or MS Excel.

3. Literature Overview

3.1. The concept of sustainability, its origin and development

Within the past few years, the term sustainability and terms derived from it, such as sustainable development or sustainable life have been used very frequently not only in scientific literature and at conferences, but also in public and in legislative practice (Moudrý, 2007).

The terms express something which is enduring, continuing its existence over time. Their use is often mainly connected to sustaining forms of human society or to one of its conditions - sustainable agriculture (Nátr, 2005). Sustainability means maintaining the basic conditions for sustaining life on the planet. The global ecosystem capacity provides food, raw materials, air, water, energy. The sink capacity then determines the ability to assimilate trash. Sustainability requires maintaining these resources, not reducing them (Goodland, 1995, Nátr, 2005).

Sustainability is an economic, social, and ecological concept, where all three of these elements are intertwined. It can be viewed as a means of configuring civilization and human activity in a way that society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely (Wordiq, 2010).

3.1.1. Origin and development

The first references to sustainability are accredited to T.R. Malthus when he, in his publication *An Essay on the Principle of Population* (1878), warned against pressures caused by the exponential growth of human population on limited amount of resources. Another reference is in J.S. Mill's work *Principles of Political Economy* published in 1848 (Goodland, 1995).

The development of the concept continued with economic, political, and ethical discussions, appeals and international conferences, especially after the Second World War,

when a view of technology-driven economic growth gave way to a perception that the quality of the environment was closely related to economic development (Wordiq, 2010).

In the second half of the 1960s, a free association of economists, politicians, and scientists from all five continents, who shared similar fears about future development of human civilization, the so-called Club of Rome, started to develop its activities. In 1972 they published a book *The Limits to Growth* and shocked the world (Nátr, 2005).

By computer modeling based on a variety of different assumptions concerning the future state of the world, they came to conclusion that the world might collapse if the current rates of growth in such areas as resource use, industrial output, food production and population expansion continued on their then current course (SustainableScale, 2003).

The authors of the study intended to stimulate debate and discussion about how to deal with the projected overshoot of global carrying capacity which was revealed by their modeling.

People around the world began to recognize the global threat to the environment at the turn of 60s and 70s, when single, rather localized problems developed into mutually interconnected global threats. The protection of environment, nature and natural resources has become a necessity and a condition for future development of the economy and civilization. At the same time, the basic conflict between economic development and the need to maintain the biosphere's base of resources emerged (Moldan, 2003).

Since then, the issue of sustainability has become a frequent topic of discussion in publications, science, politics, and among the general public. However, despite the many years since the topic was first addressed, the problem it recognized is still alive and may be more urgent than ever before.

3.1.2. Definition

A classic definition of sustainable development was set out in *Our Common Future* (the so-called Brundland Report) published in 1987:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs and without

detriment to other peoples.” (UN World Commission on Environment and Development, 1987).

The three fundamental, inseparable and interdependent components to sustainable development were highlighted: environmental protection, economic growth and social equity (MZP, 2008).

Despite much criticism of this definition, it has not significantly changed since then. However, there are many different addenda to this definition in various sources and the whole concept of sustainability is still evolving.

3.1.3. Three dimensions of sustainable development

3.1.3.1. Economic aspect of sustainability

The economic pillar of sustainability is based on natural capital, means the goods and services of the geo-biosphere; space, food, various materials, energy, stable climatic conditions, etc. They can be also referred to as natural resources. Significant roles are played by global life-giving systems such as the hydrological cycle, the stratosphere’s ozone layer and climatic systems including ocean circulation, geobiochemical cycles of elements and molecules, biodiversity at the genetic, species, ecosystem, and landscape levels. They are all of key importance for economic activities (Moldan, 2003, Čáslavka et al., 2010).

Traditionally, the primary common denominator in operational strategies has been profit. Material production is a basis for the unity of social relationships, relationships among people and relationships between people and nature. Negative effects of production and reproduction of societal life point out at certain shortness of both social relationships to nature and relationships amongst people (Kudrna et al., 1988).

The fundamental contribution of the idea of sustainable development in economic area is broadening “the assets frame” overstepping the traditional economic demarcation. It subsists on recognition of the worth of natural capital as an important presumption and legitimate element of both economic theory and practice (Moldan, 2010). The modern concept underlying economic sustainability seeks to maximize the flow of income that could be generated while at least maintaining the stock of the assets (or capital) that yields this income (Munasinghe, 2007).

Beyond GDP

GDP is a generally accepted economic indicator. Certainly, there is some correlation between human wellbeing and GDP. In principle, though, these are two different things. It is important to find some more reliable indicator or indicators that would complement GDP and that would in a better way express both the state of society's well-being and the degree of health of natural ecosystems (Čáslavka, 2010, Moldan, 2010).

The measurement of economic sustainability, or even of overall sustainability of development, it is necessary to develop or improve already existing aggregates, such as:

- the Index of Sustainable Economic Welfare, ISEW or
- the Genuine Progress Indicator, GPI.

Such indicators are regarded as predicative, not only for the economy but also with respect to all forms of capital and linkages between them, as indicators of sustainable development (Hák, 2010).

3.1.3.2. Environmental aspect of sustainability

Environmental sustainability refers to the environmental actions or impacts of what we do. In moving towards sustainability, one of the approaches is to reduce our ecological footprint. This leads to reducing the amount of resources people use (and buy), as well as the waste and emissions people produce. The ecological footprint is a broad measure of resources use which highlights where consumption is exceeding environmental limits (Ecologicalfootprint, 2011).

Not many global issues are more important than the environment, including climate change. The dangers of global warming, environmental degradation, the loss of biodiversity and the potential for conflict growing out of competition over dwindling natural resources such as water, need to be dealt with as the great moral, economic and social imperative of our time (UNEP, 2007).

3.1.3.3. Ecological crisis

The term “crisis” usually indicates such phase of conflict development within a certain system, in which the opposites are becoming mutually independent and when that system's continued existence is in doubt. The old Greek term KRÍSIS originally denoted a trial. It was also used in medicine to signify the phase of a disease when life hung in the balance – between healing and death. Thus the crisis of the world's ecological system (the natural

environment of human society) can be understood as a certain phase in its development, when its further existence is being decided, when both possibilities are realistic, its collapse or possible evolution (Kudrna et al.,1988).

Damage to the natural environment is one of the most serious current problems current in the world. If we search for its causes, they are almost mostly of a social character. Similarly, almost every unfavorable change in the natural environment has consequences in the social sphere. Likewise, a way out of the so-called ecological crisis is not possible without solving the social issues. The connectedness between the state of the biosphere and social phenomena, i.e. means of production, standard of living, value orientation of society and sometimes simply the size of the population is often complicated and unclear, but undeniable (Librová, 1987).

It is possible to talk about the world ecological crisis to such an extent that our action (or inaction) decides whether a certain ecological system will be subverted or preserved. Similarly, it is possible to denote the current global ecological situation as a global crisis of the biosphere if the way mankind reproduces and produces its means of existence endangers its stability. One can also rightfully talk about the world crisis of the ecological system even in places where – with respect to the necessary time interval between the cause and the effect (the so-called lag), which is due to the complexity of the system – the degradation of ecological conditions is not immediately perceptible (Kudrna et al., 1988).

Overcoming relationships destructive to nature requires overcoming destructive relationships among people to the extent that these destructive relationships among people are the cause of nature's devastation. In the current conditions of civilization, it is not possible to create and develop gentle relationships towards nature without just relationships among people; without relationships that exclude wars, intolerance, terror, and prejudices (Kudrna et al., 1988).

3.1.3.4. Social aspect of sustainability

The social pillar reflects the development of both human personality and social strata. The personality development segment focuses on improving areas of the quality of life, such as:

- health and well-being;
- a feeling of safety and security;
- a dignified place in society and social recognition;
- free choice of direction and fulfillment of one's own life;
- a favorable natural environment;
- the provision of all basic human and civic rights and freedoms that usually are guaranteed by constitutions of democratic states (Moldan, 2003).

According to Kudrna, it is not possible to create, maintain and develop fair relationships among people if at the same time favorable relationships towards nature are not created, maintained and developed; that is, such relationships as allow reproduction of natural living conditions on Earth. It is becoming evident that destructive relationships towards nature are destructive of relationships among people – devastation of the Earth means endangering health and dignified life not only of contemporary but also of future, as yet unborn generations. One can therefore say that one of the conditions to overcoming destructive relationships to people is overcoming destructive relationships towards nature (Kudrna et al. 1988).

The emphasis on the role of social factors in changes to the biosphere has also influenced sociology as a science, or perhaps has modified social ecology as its discipline. The relationship between man, or society and the natural environment, is coming to the fore (Librová, 1987).

3.2. Agriculture and its role in the society

With the exception of hunter-gatherer societies, all humans meet their basic existence needs through agricultural activities. In civilized societies, it is often forgotten that food is produced by the growing of crops and breeding of animals. However, some agricultural disasters, such as BSE (Bovine spongiform encephalopathy), remind us immediately and vigorously of the vital role of agriculture (Kuhnen, 1978, Nátr, 2005).

The purpose of agricultural husbandry is the systematic management of the landscape to satisfy both individual and societal needs. The primary goal of farming operations is the production of food and other materials used for technical purposes (fibers for cloth, building materials, fuel, etc.). The systems of agricultural activities are still predominantly understood as production systems. Besides production, agriculture serves many other functions. From the perspective of agro-ecosystems, the most significant non-production function is caring for public estates such as soil, water, and air, as well as serving cultural and social recreational function (Moudrý, 2007).

Traditionally, in every country or region the inhabitants were dependant on the bread-basket filled by the local farmers, i.e., everybody depended on agriculture and was interested in its fate. In recent times, regional and international trade has reduced the dependence on home agriculture, and the quantity of available food is both a function of the harvest and political decisions on the amount of food imports and exports (Kuhnen, 1978).

In most OECD (Organisation for Economic Co-operation and Development) countries, including the Czech Republic, the output of agriculture accounts for only 2% of GDP, but in developing countries (e.g. India) it is a major employer and source of national income. Different types of households depend on agriculture in the developing world, i.e. large-scale commercial, traditional local, subsistence-based, landless rural, and chronically poor rural households, many of which are no longer economically active (OECD, 2008). A high dependence on agriculture signifies a high sensitivity to changes in the environment, such as drought and floods.

Currently, most of the small farmers worldwide find themselves at the poverty line as a consequence of development strategies that accredit to small-scale farming a low valuation. Trade liberalization has also contributed to such state. From the 1980s, many developing countries have opened their agricultural markets, leading to an increase of imports of cheaper products that were in some developed countries subsidized, depressing the prices of agricultural products in importing countries. Local farmers are not able to compete with such prices. The situation is unfavourable especially for women, who produce at least of 65% of all food consumed worldwide (Sachs, Santarius, 2009).

Agricultural growth has the potential to enable poor countries and households to advance economically through its leverage effects on the rest of the economy. However, due to unsustainable trends in production and resource use, which are exacerbated by a lack of policy coherence for agriculture, the possible contributions may not be realized (OECD, 2008).

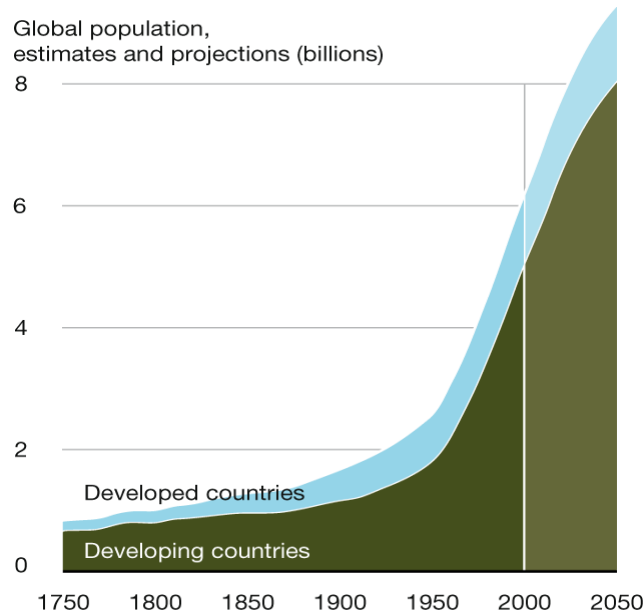
Trade liberalization supports stronger export orientation of the agricultural sector. Export production competes with food production for the local market, making it difficult for both local farmers and consumers (Sachs, Santarius, 2009).

3.2.1. Challenges for agriculture

Nowadays, world agriculture is facing significant challenges. The world has to provide food for many more people than it ever was before. At the same time, this has to be done so with a decreasing supply or ever more costly energy resources and raw materials because these have been depleted or are not accessible for various reasons. While industrialized society was strongly focused on technologies enabling the maximum extraction of energy and raw materials from the planet, the new civilization will have to search for new possibilities to renew energy and to recycle needed raw materials while at the same time feeding excessive number of inhabitants (Kudrna, 2008).

The following Figure 1 shows the trends in population.

Figure 1: Trends in population, developed and developing countries, 1750-2050 (estimates and projections)



Source: UNEP/GRID-Arendal, 2009

According to OECD, in the period 2005-2030, food demand is expected to increase by 50% fuelled by population growth of 27% and income growth of 83%. Such scenario has challenging implications for the sustainability of world agriculture (OECD, 2008):

- Agricultural land use will have to increase by 10% to meet expected demands on food, and even further if biomass for energy production is included. Agricultural land use is currently at 40% of total available land. However, usable land is constantly decreasing. While in the year 1650 the usable land on Earth was 32mil km², in the year 2000 it had fallen to 24 mil km² and according to predictions of world statistics, in 2050 it will be only 18mil km² (Kudrna, 2008).
- Agricultural area will grow by only 4% within the OECD area, but by as much as 18% in Africa.
- Agricultural production will become more land-intensive with growth in agricultural productivity per hectare of around 40%.
- Global emissions of greenhouse gases will increase by 2% due to land use changes, with large variations by region.

- The availability and quality of global water resources will be under increasing pressure owing to the projected growth in agricultural production (OECD, 2008).

In some parts of the world the negative effects of the scenario above will be stronger than in other parts; however all parts of the planet will be affected.

3.2.2. Is conventional farming sustainable?

Agriculture has changed dramatically, especially over the last 70 years. With new technologies, mechanization, increased chemical use, and government policies that favored maximization of production, food and fiber productivity soared. Although these changes have had many positive effects and reduced many risks in agriculture, there have also been large costs; among these are topsoil depletion, groundwater contamination, the decline of family farms, continued neglect of living and working conditions for farm workers, increasing costs of production, and the disintegration of economic and social conditions in rural communities (Feenstra, 2006).

In general, conventional or industrial agriculture has simplified the structure of the environment over vast areas, replacing nature's diversity with a small number of cultivated plants and domesticated animals with an intention of higher productivity. However, such efforts have had many negative implications for sustainable development. Conventional agricultural practices in crop production require a great deal of resources, including disproportionate amounts of water and the fossil fuel that is needed to make chemical fertilizer, mechanize working the land and its crops, running irrigation sources, heating buildings and crop dryers, and transportation (Bittman, 2011). It makes such agriculture unsustainable in the long-term, as the Earth is not able to replenish such amount of resources.

Conventional agriculture poses greater long-term economic risks than "sustainable" alternatives (GTZ Sustainet, 2006). An international panel of 400 agricultural scientists call for fundamental change in farming practice (Mae-Wan, 2008).

However, conventional agriculture has still a major benefit that is undeniable: cheap and plentiful food (Frederick, 2010).

The figure below (Figure 2) presents an overview of measures in intensive crop production and their significant consequences.

Figure 2: Overview of significant consequences of intensive crop production

Measures	Consequences - effects
<i>High nitrogen fertilization (in both industrial and organic fertilizers)</i>	<ul style="list-style-type: none"> – nitrogen residua in soil – contamination of both ground and surface waters – flight of nitrogen to atmosphere
<i>Use of pesticides, regulators and other agrochemicals</i>	<ul style="list-style-type: none"> – accumulation of active substance residua in soil – destroying useful microorganisms, antagonists, and other organisms in soil – development of resistance against pesticides – decrease in number of species of fauna and flora – contamination of both ground- and surface waters – air pollution
<i>Use of heavy mechanization</i>	<ul style="list-style-type: none"> – infringement of air and water soil regime – restriction of soil rooting – destruction of biological activity of soil – destruction of infiltration ability of soil – higher soil erosion
<i>Intensive soil management</i>	<ul style="list-style-type: none"> – restriction of soil structure formation – higher erosion – humus decomposition
<i>High energy use (mostly fossil fuels)</i>	<ul style="list-style-type: none"> – non-renewable consumption of resources – higher air pollution

Source: Moudrý, 2007

The Figure 3 represents a comparison of two different approaches to understandings of relationships between man and nature.

Figure 3: The characteristics of conventional and ecological understandings of relationships between man and nature

Conventional	Ecological
Anthropocentrism	The man is inseparable from nature
Superiority over nature	Harmony with nature
No moral responsibility towards nature	Moral and ethical responsibility towards nature
Nature is only a source of raw materials	Nature has its own natural value
Exploitation	Protection

Source: Lacko/Bartošová, 2005

3.3. The multiple functions of agriculture and their relations to sustainability

“Multifunctional Agriculture” is a term that has emerged from obscurity into common use in environmental, agricultural and international trade circles. This concept points to the benefits in agriculture that often go unrewarded in the marketplace and that can greatly vary depending on farming practices (DeVries, 2000). The concept of multifunctional agriculture recognizes multiple output activities – not only the production of commodities (food, fodder, fibers and biofuels), but also non-commodity outputs such as ecosystem services, landscape amenities and cultural heritage. Agriculture also accumulates a vast storehouse of knowledge about various farming procedures (Sachs, Santarius, 2009).

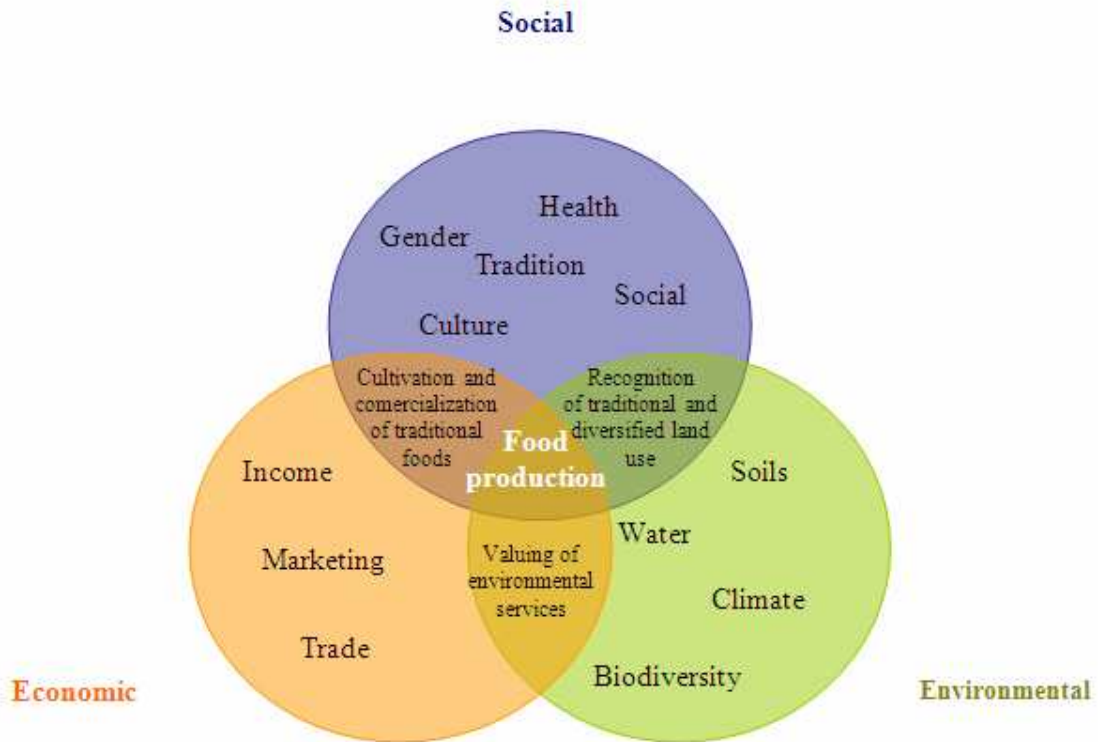
Multifunctional approach refers to the whole range of environmental, economic and social functions associated with agriculture and related land-use. Analysis of the multifunctional character contributes to understanding the potential linkages, synergies and trade-offs necessary to achieve sustainability in agriculture and rural development (FAO, 1999).

According to a declaration of OECD Agricultural Ministers Committee (1998):

“Beyond its primary function of producing food and fiber, agricultural activity can also shape the landscape, provide environmental benefits such as land conservation, the sustainable management of renewable natural resources and the preservation of biodiversity, and contribute to the socio-economic viability of many rural areas. Agriculture is multifunctional when it has one or several functions in addition to its primary role of producing food and fiber.” (OECD Declaration of Agricultural Ministers Committee, 1998).

The diagram below (Figure 4) shows the interconnectedness of agriculture's different functions and roles and their relations to sustainability.

Figure 4: The interconnectedness of agriculture's different roles and functions



Source: author, based on UNEP/GRID-Arendal, 2008.

Very specific function of agriculture is education. It is considered as one of the functions in multifunctionality that provides people with a first-hand experience with agriculture and their rural heritage (MAFFJ, 2004). The main difference in the nature of the educational function as multifunctionality in comparison to other functions such as land preservation, landscape forming, bio-diversity, etc., is the object of its effects. Land preservation and landscape forming functions directly affect rural resources and the environment, but indirectly affect human resources as economic units. In contrast, the effects of the educational function directly work on human resources (Ohe, 2009).

However, the multiple functions of agriculture still get very little attention from those developing international trade policies, which are viewed mainly from an economic perspective. In order to maximize the value of production, international trade policy exposes agricultural production to increasing competition which endangers its multifunctional character (Sachs, Santarius, 2009).

3.4. Sustainable agriculture

The nourishment of people, in the broadest sense of the word, at the current level of development of human society is and will remain the absolute needs for our lives. With an increasing number of people on the planet, man must by his activities first and foremost secure these needs (Kudrna et al., 1988). Agriculture plays a crucial role in such efforts.

We can compare three broad types of farming:

- traditional production systems
- conventional modern agriculture (such as Green Revolution technologies)
- sustainable agriculture

Sustainable agriculture is a broad concept that covers a number of different approaches. All try in one way or the other to achieve environmentally sound, economically profitable, ethically acceptable and socially responsible forms of land husbandry (GTZ Sustainet, 2006).

From the overview of sustainable agriculture definitions arises, that this concept pictures a very broad and altogether vague description of goals and wishes. It can be also understood more as a motivation for scientific development than as a description of sustainable agriculture technologies (Nátr, 2005).

One of the approaches to sustainable agriculture is expressed in the following definition of the UN Food and Agriculture Organization (FAO, 1995). Sustainable agriculture is a process that meets the following criteria:

“(1) Ensures that the basic nutritional requirements of present and future generations, qualitatively and quantitatively, are met while providing a number of other agricultural products. (2) Provides durable employment, sufficient income, and decent living and working conditions for all those engaged in agricultural production.

(3) Maintains and, where possible, enhances the productive capacity of the natural resource base as a whole, and the regenerative capacity of renewable resources, without disrupting the functioning of basic ecological cycles and natural balances, destroying the socio-cultural attributes of rural communities, or causing contamination of the environment; and (4) Reduces the vulnerability of the agricultural sector to adverse natural and socio-economic factors and other risks, and strengthens self-reliance.” (FAO, 1995)

Simply put, sustainable farming must produce adequate high-quality yields, be profitable, protect the environment, conserve resources and be socially responsible in the long term. Evidence proves that ecological (or organic) farming has significantly higher results than the conventional systems of agriculture (Ching, 2002).

3.4.1. Economic aspects of sustainable agriculture

Agriculture has to be economically viable over the long term; otherwise it cannot be sustainable. According to Martin Khor, Director of the Third World Network, ecological farming is superior, not only for the environment, but also for gains in productivity and farmer's incomes (Khor, 2004). Sustainable agriculture generates more employment per hectare and thus supports rural communities. Because small farms are a part of local and regional economic structures, their demand for goods and services is a source of incomes for other rural households, which enhances rural economy. Especially in countries of Southern hemisphere, where the majority works in the agricultural sector, small farms significantly help to secure food and eradicate poverty (Sachr, Santarius, 2009).

3.4.2. Environmental aspects of sustainable agriculture

Sustainable agriculture has many significant advantages over both conventional and traditional practices. Most conventional and many traditional farm practices are not ecologically sustainable due to the overuse of natural resources, reducing soil fertility, causing soil erosion, and contributing to global climatic change (GTZ Sustainet, 2006).

Environmental aspects of sustainable agriculture:

Soil – Sustainable agriculture improves soil fertility and soil structure and prevents erosion. Healthy soil is a key component of sustainability; healthy soil will produce healthy crop plants that have optimum vigor and are less susceptible to pests (Feenstra, 2006).

Water - Water is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged. Irrigation is the biggest consumer of fresh water, and fertilizers and pesticides contaminate both surface- and groundwater. Sustainable agriculture increases the organic matter content of the topsoil and

thus water is more effectively retained and stored. Sustainable agriculture eliminates the release of harmful substances into nature (Feenstra, 2006, GTZ Sustainet, 2006).

Biodiversity – The term biodiversity captures nature’s richness and diversity and its biological interdependence. All species on earth may to a greater or lesser extent be dependent on one another; the extinction of one species may weaken the survival chances of another. On a broad scale, forests, for instance, are the biggest regulators of carbon dioxide from the atmosphere and producers of oxygen. With mass deforestation, our future could be seriously imperilled. And because farming occupies more land than any other human activity in most countries, it should be no surprise to learn that agriculture and biodiversity are interdependent (Parris, 2001).

Efficient use of inputs - Many inputs and practices used by conventional farmers are also used in sustainable agriculture. Sustainable farmers, however, maximize reliance on natural, renewable, and on-farm inputs. Sustainable agriculture reduces or eliminates the use of hazardous chemicals. Equally important are the environmental, social, and economic impacts of a particular strategy (Feenstra, 2006, GTZ Sustainet, 2006).

The landscape is covered by agriculture and forestry in rural areas. Inappropriate use causes erosion, landslides and flooding, clogs irrigation channels and reduces the ability of the land to support the local population, which is forced to migrate to cities. Regeneration of ecologically damaged areas needs large investments. Sustainable agriculture avoids such problems by improving productivity, conserving the soil, avoiding expansion of farming into unsuitable areas, and preserving rural jobs (GTZ Sustainet, 2006).

Climate change and agriculture are interrelated processes. Climate change is projected to have significant impacts on conditions affecting agriculture and at the same time agriculture has been shown to produce significant effects on climate change through the way it is practiced. Agriculture contributes to the production and release of greenhouse gases such as carbon dioxide, methane, and nitrous oxide, but also by altering the Earth's land cover, which can change its ability to absorb or reflect heat and light, thus contributing to radiative forcing (Wikipedia, 2011). Deforestation and desertification together with the use of fossil fuels are the major anthropogenic sources of carbon dioxide. Adopting sustainable agriculture attempts to reduce both the causes and impacts significantly (GTZ Sustainet, 2006, Ban, 2007).

3.4.3. Social aspects of sustainable agriculture

Agricultural performance and profitability are strongly linked to the well-being of farmers and rural communities (SAI, 2010). The social sustainability of farming techniques is related to the ideas of social acceptability and justice. Ignoring these issues risks losing valuable local knowledge and provoking political unrest (GTZ Sustainet, 2006).

Food security – Sustainable agriculture improves food security by improving the quality and nutritional value of the food, and by producing a bigger range of produce throughout the year, compared to traditional farming, which often fails to produce enough food, or variety of food, for a balanced diet, and conventional modern farming, which focuses on a few commodities so people still do not have a balanced diet (GTZ Sustainet, 2006).

Gender – Sustainable agriculture attempts to ensure that the burdens in terms of labor (in developing world, women usually bear the heaviest) and benefits are shared more equitably between men and women.

Local acceptance – Sustainable agriculture practices usually are based on local social customs, traditions, norms and taboos, so local people are more likely to accept them and adapt them to their own needs (GTZ Sustainet, 2006).

Indigenous knowledge – Knowledge has been developed over time in a community mainly through the accumulation of experiences and intimate understanding of the environment in a given culture. Indigenous knowledge is recorded and used to devise innovative research for agricultural researchers, extension workers, development practitioners, and environmentalists for sustainable agriculture development and management of natural resources (Tikai, Kama, 2004).

4. Empirical section

4.1. Data gathering

The main aim of the research was to find out what the perceptions about sustainable development and sustainable agriculture, as its main premise, are and how the perceptions between Czech and Indian respondent groups differ with respect to different social, environmental and economic conditions in these countries.

For the empirical section, a questionnaire was selected as the main tool for investigation. It is organized into three integral sections:

- Agriculture and its importance
- Sustainable development
- Sustainable agriculture

Most of the data from the questionnaires were processed through the SPSS program, using frequencies and cross-tabulations, or through MS Excel. A summary of responses of both Indian and Czech respondent groups are presented in tables, pictured in bar charts and assessed through descriptive statistics.

The results do not aspire to be representative for the whole population due to non-representative procedure of selecting the respondents (it was not possible to get representative samples of the Indian and Czech students in both countries). Results and their interpretations cannot be generalized as for the perceptions of either of the two groups. The other methodological limitation of the research might be in different cultural backgrounds of the two groups which might result in inappropriate interpretation of the questions by the respondents (although the pre-tests did not signal any such problem).

4.2. Data analysis

Questionnaires were filled in by 102 respondents, consisting of two equal-sized groups of students, 51 from the Czech Republic and 51 from India. In total, there were 45 female and 57 male respondents, out of which 28 Czech and 17 Indian women, and 23 Czech and 34 Indian men (Table 1). It can be supposed that the imbalanced share of female and male respondents in the Indian group reflects a higher ratio of male university students to female university students.

Qualitative research, on the same topic, based on interviews with scientists Prof. Kudrna in the Czech Republic, who has dedicated his life to study of agricultural systems, and Dr. Raja in India, is also used for interpretation and verification of the findings from the research.

Demographic data

Table 1: Sex/Nationality

			Nationality		Total
			Czech	Indian	
Sex	Female	Count	28	17	45
		% within Sex	62.2%	37.8%	100.0%
		% within Nationality	54.9%	33.3%	44.1%
		% of Total	27.5%	16.7%	44.1%
	Male	Count	23	34	57
		% within Sex	40.4%	59.6%	100.0%
		% within Nationality	45.1%	66.7%	55.9%
		% of Total	22.5%	33.3%	55.9%
Total		Count	51	51	102
		% within Sex	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

4.3. Section 1: AGRICULTURE AND ITS IMPORTANCE

This section is divided into 3 subsections:

- Multifunctional agriculture
- Negative and positive effects of agriculture
- Agriculture in the present and in the future

Multifunctional agriculture

Question 1 touches on multifunctional agriculture. Students were asked to evaluate the importance of various functions of agriculture on a 5 point scale from *very important* to *not important at all*. It can be assumed that if students appreciate all the functions as important, they acknowledge agriculture as multifunctional, which is regarded as a stepping stone to sustainable development.

Taking into account the very small share of agriculture in the Czech national economy compared to the Indian economy, it is supposed that Indian respondents perceive the importance of multiple functions of agriculture more strongly than Czech respondents.

Question 1:

Nowadays, there are frequent discussions about the multiple functions of agriculture. How would you rank the following functions of agriculture on the scale of importance?

- *Agriculture functions as a food producer.*
- *Agriculture functions as a care taker of the environment.*
- *Agriculture functions as a reservoir of renewable resources.*
- *Agriculture has an esthetical function (maintaining the beauty of the traditional landscape).*
- *Agriculture has an educational function.*
- *Agriculture has a recreational function (e.g. agro-tourism).*

In the following text, there are, for each of the presented functions of agriculture, data tables with outputs from the questionnaires. After each table, a short data analysis is presented. The overall data are interpreted at the end of this subsection.

Table 2: Agriculture functions as a food producer

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	46	51	97
		% within scale	47.4%	52.6%	100.0%
		% within Nationality	90.2%	100.0%	95.1%
		% of Total	45.1%	50.0%	95.1%
	important	Count	5	0	5
		% within scale	100.0%	.0%	100.0%
		% within Nationality	9.8%	.0%	4.9%
		% of Total	4.9%	.0%	4.9%
Total		Count	51	51	102
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

100% of the Indian students appreciate the main production function of agriculture as very important, compared to 90% of Czech respondents, the remaining 10% of whom rank the function one point lower - as important. Agriculture as a food producer scored the highest importance values among the other functions by both of the respondent groups. Production of food is absolutely perceived on the top from all the agricultural activities.

The second evaluated function of agriculture is its environmental function (see table 3). Agriculture and related land use can have beneficial or harmful effects on the environment.

Table 3: Agriculture functions as a care taker of the environment

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	15	44	59
		% within scale	25.4%	74.6%	100.0%
		% within Nationality	29.4%	86.3%	57.8%
		% of Total	14.7%	43.1%	57.8%
	important	Count	27	5	32
		% within scale	84.4%	15.6%	100.0%
		% within Nationality	52.9%	9.8%	31.4%
		% of Total	26.5%	4.9%	31.4%
	moderately important	Count	4	2	6
		% within scale	66.7%	33.3%	100.0%
		% within Nationality	7.8%	3.9%	5.9%
		% of Total	3.9%	2.0%	5.9%
	not important	Count	5	0	5
		% within scale	100.0%	.0%	100.0%
		% within Nationality	9.8%	.0%	4.9%
		% of Total	4.9%	.0%	4.9%
Total		Count	51	51	102
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

The function of agriculture as a care taker of the environment has higher ranking amongst Indian students than amongst Czech students. Altogether this function scored values of high importance. Environment is largely influenced by agriculture and also reciprocally agriculture is influenced by the environment. In the interview with Indian students, the typical argument for the environmental function of agriculture was: “No environment, no agriculture. To take care of the environment should be the priority.”

Table 4: Agriculture functions as a reservoir of renewable resources

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	16	32	48
		% within scale	33.3%	66.7%	100.0%
		% within Nationality	31.4%	62.7%	47.1%
		% of Total	15.7%	31.4%	47.1%
	important	Count	19	16	35
		% within scale	54.3%	45.7%	100.0%
		% within Nationality	37.3%	31.4%	34.3%
		% of Total	18.6%	15.7%	34.3%
	moderately important	Count	12	3	15
		% within scale	80.0%	20.0%	100.0%
		% within Nationality	23.5%	5.9%	14.7%
		% of Total	11.8%	2.9%	14.7%
not important	Count	4	0	4	
	% within scale	100.0%	.0%	100.0%	
	% within Nationality	7.8%	.0%	3.9%	
	% of Total	3.9%	.0%	3.9%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Similar to the function of agriculture as a caretaker of environment, the function of agriculture as a reservoir of renewable resources (Table 4) had a higher ranking amongst Indian respondents than amongst Czech respondents. It can be assumed that the reason why the Czech respondents are not very strongly convinced about this function may be determined by insufficient awareness that renewable resources, such as agro-fuels and fibers for cloth, mostly come from agricultural sector.

The next table (Table 5) represents ranking of esthetical function of agriculture. Agriculture cannot be separated from its esthetical effects, either positive or negative, on the appearance of the countryside; erosion, large monoculture areas, changes in the mosaic of a countryside, depleted soil, etc.

Table 5: Agriculture has an esthetical function

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	8	32	40
		% within scale	20.0%	80.0%	100.0%
		% within Nationality	15.7%	62.7%	39.2%
		% of Total	7.8%	31.4%	39.2%
	important	Count	23	9	32
		% within scale	71.9%	28.1%	100.0%
		% within Nationality	45.1%	17.6%	31.4%
		% of Total	22.5%	8.8%	31.4%
	moderately important	Count	16	7	23
		% within scale	69.6%	30.4%	100.0%
		% within Nationality	31.4%	13.7%	22.5%
		% of Total	15.7%	6.9%	22.5%
	not important	Count	4	1	5
		% within scale	80.0%	20.0%	100.0%
		% within Nationality	7.8%	2.0%	4.9%
		% of Total	3.9%	1.0%	4.9%
	not important at all	Count	0	2	2
		% within scale	.0%	100.0%	100.0%
		% within Nationality	.0%	3.9%	2.0%
		% of Total	.0%	2.0%	2.0%
Total		Count	51	51	102
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

The esthetic function, maintaining the beauty of the traditional landscape, is not found by Czech students as highly important as the previously mentioned functions. This indicates a lack of appreciation for those functions that do not have a perceived economic value. The majority of Indian students (63%) rank the esthetic function on the highest level of importance. This perhaps reflects the fact that agriculture is an important part of the daily lives of most Indian people and they encounter its effects on a day to day basis, recognizing the importance of the esthetic function.

The following table (Table 6) represents the results for the educational function of agriculture:

Table 6: Agriculture has an educational function

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	1	31	32
		% within scale	3.1%	96.9%	100.0%
		% within Nationality	2.0%	60.8%	31.4%
		% of Total	1.0%	30.4%	31.4%
	important	Count	15	7	22
		% within scale	68.2%	31.8%	100.0%
		% within Nationality	29.4%	13.7%	21.6%
		% of Total	14.7%	6.9%	21.6%
	moderately important	Count	15	7	22
		% within scale	68.2%	31.8%	100.0%
		% within Nationality	29.4%	13.7%	21.6%
		% of Total	14.7%	6.9%	21.6%
	not important	Count	20	4	24
		% within scale	83.3%	16.7%	100.0%
		% within Nationality	39.2%	7.8%	23.5%
		% of Total	19.6%	3.9%	23.5%
not important at all	Count	0	2	2	
	% within scale	.0%	100.0%	100.0%	
	% within Nationality	.0%	3.9%	2.0%	
	% of Total	.0%	2.0%	2.0%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Education forms fundamental social conditions for economic development and efficiency of the whole society. Likewise, it is expected that the educational function of agriculture lets people recognize the significance of rural resources, such as rural heritage, farm life and knowledge of where food comes from, and eventually leads to a better resource allocation nationwide between urban and rural areas (Ohe, 2009).

While the educational function (Table 6) is perceived by 61% of Indian students as very important, only 2% of the Czech students rank this function on this level. The points - important and moderately important – were both ranked by 29% and not important by 39%.

The educational function of agriculture and its effects directly work on human resources. However, due to the decreasing share of agriculture in the Czech national economy, a possible perception that agriculture is ‘un-modern’, and the very rare contact between the average Czech and the farms where food is produced, Czech students do not give to this function a high recognition.

The following table (Table 7) shows the results of ranking for recreational function:

Table 7: Agriculture has a recreational function

			Nationality		Total
			Czech	Indian	
Scale	very important	Count	1	29	30
		% within scale	3.3%	96.7%	100.0%
		% within Nationality	2.0%	56.9%	29.4%
		% of Total	1.0%	28.4%	29.4%
	important	Count	9	5	14
		% within scale	64.3%	35.7%	100.0%
		% within Nationality	17.6%	9.8%	13.7%
		% of Total	8.8%	4.9%	13.7%
	moderately important	Count	23	9	32
		% within scale	71.9%	28.1%	100.0%
		% within Nationality	45.1%	17.6%	31.4%
		% of Total	22.5%	8.8%	31.4%
	not important	Count	18	7	25
		% within scale	72.0%	28.0%	100.0%
		% within Nationality	35.3%	13.7%	24.5%
		% of Total	17.6%	6.9%	24.5%
not important at all	Count	0	1	1	
	% within scale	.0%	100.0%	100.0%	
	% within Nationality	.0%	2.0%	1.0%	
	% of Total	.0%	1.0%	1.0%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

The recreational function of agriculture was perceived as not very important, similar to the educational function, amongst Czech students, and similar to other functions as very important amongst Indian students.

Farm diversification, adding new money making activities, such as agro-tourism, can be an asset for the rural development. It generates not only employment and income, but contributes to the reputation of the territory and its further attractiveness for visitors. Indian students seem to recognize importance of the recreational function in contrast to Czech students.

Overall evaluation of “Multifunctional agriculture”

The question was designed to find out how people rank the functions of agriculture on a 5- point scale of importance. Multifunctional agriculture plays a significant role in the concept of sustainability. It includes a large variety of activities and diversification approaches within the context of environmental, social and economic functions of agriculture (Zásada, 2011).

In the move towards sustainable agriculture, it is necessary to acknowledge other benefits of agriculture apart its production function. Raja agrees that multifunctionality is for sustainable agriculture a key concept.

The results of the questionnaire proved the assumption that Czech respondents do not strongly acknowledge non-production functions of agriculture, whereas the majority of Indian respondents appreciated all the functions as very important.

As discussed earlier, the reasons for the difference in perceptions of the importance of the functions of agriculture between the two respondent groups may be determined by the different role that agriculture plays in each country; economically, socially, and environmentally. For most of the Indian people, agriculture is a direct part of their daily lives and thus we can suppose their higher awareness about all the important functions that agriculture has. Also education and media play an important role in shaping perceptions of individuals. Based on the interviews with Indian people, agricultural education is much stronger in India than in the Czech Republic. Czech culture is rather economically orientated, which is mirrored in the results of the Czech respondents. Other aspects verifying the differences between Indian and Czech perceptions are discussed within the further course of the empirical section.

Negative and positive effects of agriculture

As with most economic activities, agriculture has its negative and positive effects. It is assumed that the negative effects are reflected differently in the Czech Republic and in India. Question 2 tries to investigate what is perceived to be on the top of the negative effects for each of the respondent groups.

Question 2

What do you consider to be the most serious negative effect of agriculture?

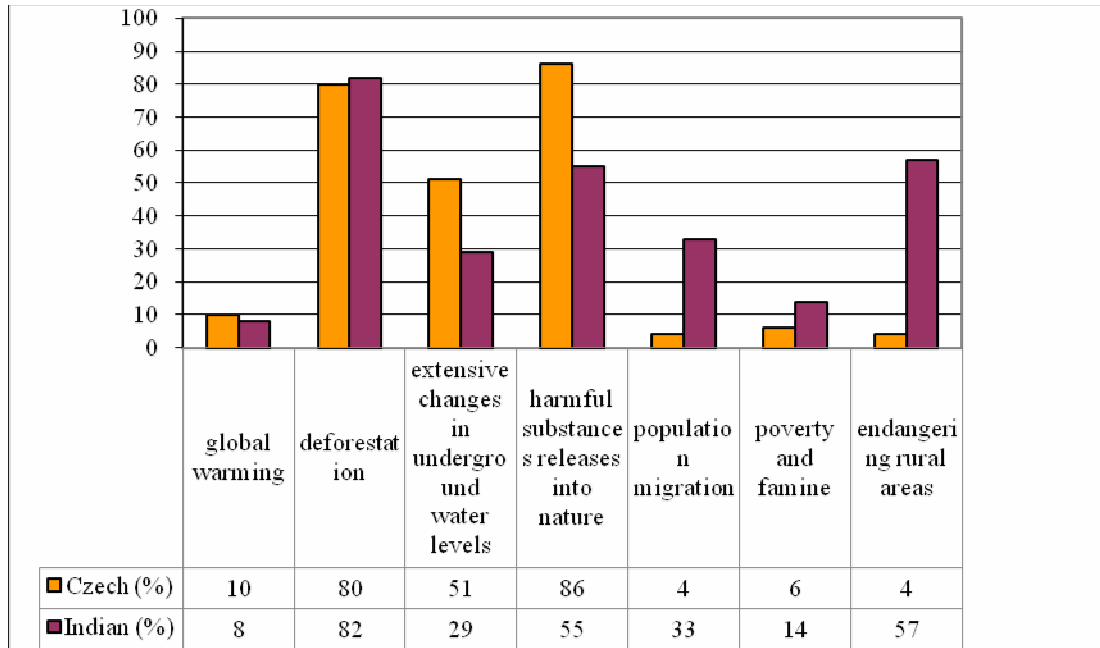
- *global warming*
- *deforestation*
- *extensive changes in underground water levels*
- *harmful substances releases into nature*
- *population migration*
- *poverty and famine*
- *endangering rural areas*

Students could select up to three items so some percentages add up to more than 100%.

Table 8: What do you consider to be the most serious negative effect of agriculture?

	Czech (%)	Indian (%)	Total (%)
Deforestation	80	82	162
Harmful substances releases into nature	86	55	141
Endangering rural areas	4	57	61
Extensive changes in underground water levels	51	29	80
Population migration	4	33	37
Poverty and famine	6	14	20
Global warming	10	8	18

Bar chart 1: What do you consider to be the most serious negative effect of agriculture?



Deforestation was classified as the most serious negative effect of conventional agriculture for both groups in total. Based on the theory in the literature review and verification with a noted scientist Kudrna, deforestation is proved to be the most serious negative effect since it causes changes in underground water levels, which has an extremely serious impact on both agriculture and animal life on the Earth. In addition to acting as the most important safeguards of underground waters, forests are also significant CO₂ regulators, and erosion and ecosystem protectors. It has been shown that agriculture is one of the biggest actors in deforestation. The views of both Czech and Indian students seem to be roughly in line with scientific research regarding agriculture.

Further, the release of harmful substances into nature are on the top of perceived negative effects for the Czech respondents. Factually, there is evidence of the serious risks to health and the environment posed by the release of agricultural substances (Euractiv, 2008). It is assumed that Czech people are conscious of potential health issues and possible environmental damage (also based on findings from question 6).

The Indian students perceive the threat that conventional agriculture poses to rural areas even more strongly than do the Czech students, which perhaps reflects the fact that the majority of Indian people live in rural conditions, living from agriculture. In line with the literature review, industrial agricultural activities involve greater risks for rural areas, including environmental, social, and economic conditions in rural communities, such as

groundwater contamination, decline of family farms, continued neglect of living and working conditions for farm workers, increasing costs of production, etc. In addition, industrial farms in developed countries are often export oriented, posing a threat to farmers in the developing world who are not able to compete with such products that are often subsidized and thus cheaper than local products. Such effects are, of course, more evident in countries with bigger shares of agriculture in the national economy.

Question 3

What do you consider to be the biggest positive effect of modern conventional agriculture?

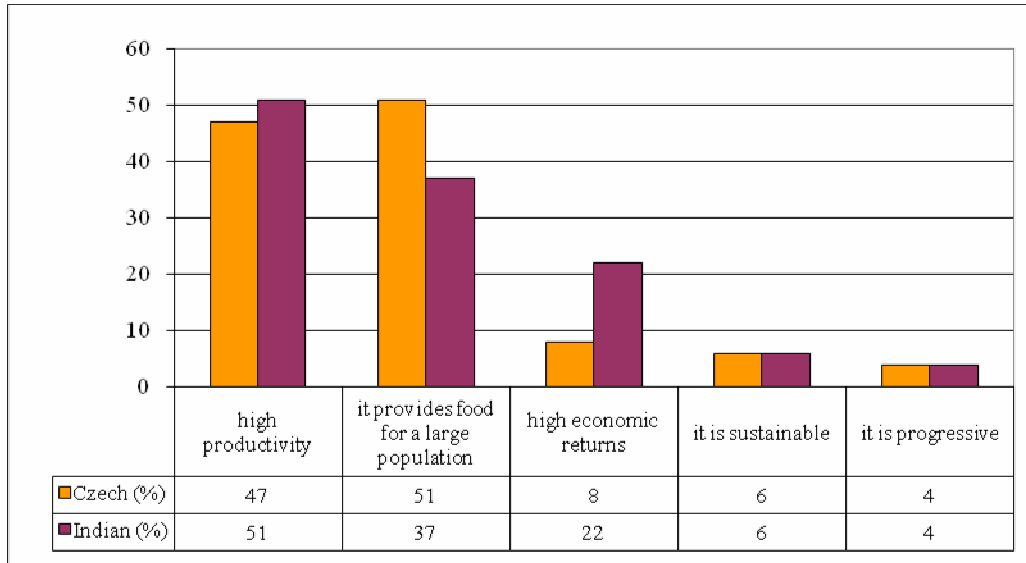
- *high productivity*
- *high economic returns*
- *it is progressive*
- *it provides food for a large population*
- *it is sustainable*

In the following table (Table 9), there are results of question 3 from Czech and Indian students in the order from the highest scoring items to the least scoring for the both groups in total.

Table 9: What do you consider to be the biggest positive effect of modern conventional agriculture?

	Czech (%)	Indian (%)	Total (%)
High productivity	47	51	98
It provides food for a large population	51	37	88
High economic returns	8	22	30
It is sustainable	6	6	12
It is progressive	4	4	8

Bar chart 2: What do you consider to be the biggest positive effect of modern conventional agriculture?



High productivity and the ability to generate food for large populations are on the top of the biggest positive effects of conventional agriculture. The results are verified by both Kudrna and Raja. However, regarding the item high economic returns, it has been argued by many that in the long-run, conventional agriculture poses greater economic risks due to negative implications for the environment and society, and that it therefore cannot be classified as sustainable.

Agriculture in the present and in the future

Questions 4 and 5 are based on the basic definition of sustainable development. The aim is to find out how students perceive meeting the needs of today and of tomorrow by agriculture.

Question 4

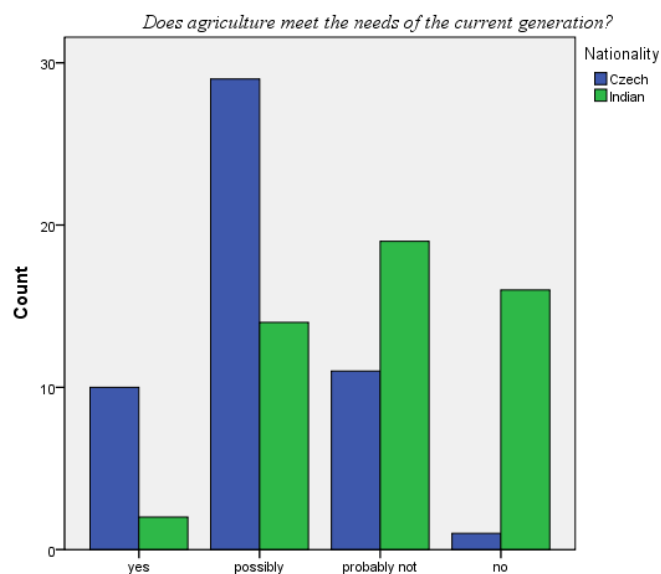
Does agriculture meet the needs of the current generation?

Respondents could check one out of two positive and two negative answers.

Table 10: Does agriculture meet the needs of the current generation?

			Nationality		Total
			Czech	Indian	
Scale	yes	Count	10	2	12
		% within scale	83.3%	16.7%	100.0%
		% within Nationality	19.6%	3.9%	11.8%
		% of Total	9.8%	2.0%	11.8%
	possibly	Count	29	14	43
		% within scale	67.4%	32.6%	100.0%
		% within Nationality	56.9%	27.5%	42.2%
		% of Total	28.4%	13.7%	42.2%
	probably not	Count	11	19	30
		% within scale	36.7%	63.3%	100.0%
		% within Nationality	21.6%	37.3%	29.4%
		% of Total	10.8%	18.6%	29.4%
no	Count	1	16	17	
	% within scale	5.9%	94.1%	100.0%	
	% within Nationality	2.0%	31.4%	16.7%	
	% of Total	1.0%	15.7%	16.7%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 3: Meeting the needs of the current generation



Czech students mostly believe that agriculture possibly meets the needs of the current generation (57%) while Indian students are rather pessimistic. It is a matter of fact that India, as a developing country, encounters famine due to lack of food or unequal distribution of food.

Question 5

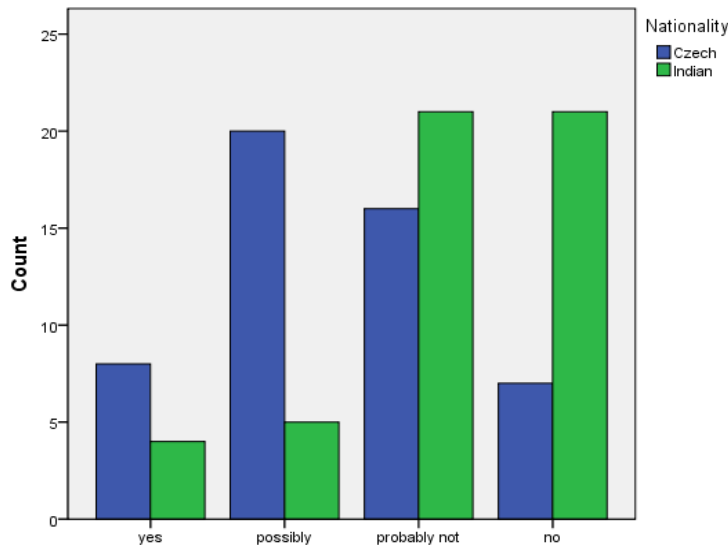
Does agriculture as currently practiced compromise the ability of future generations to meet their own needs?

Table 11: Does agriculture as currently practiced compromise the ability of future generation to meet their own needs?

			Nationality		Total
			Czech	Indian	
Scale	yes	Count	8	4	12
		% within scale	66.7%	33.3%	100.0%
		% within Nationality	15.7%	7.8%	11.8%
		% of Total	7.8%	3.9%	11.8%
	possibly	Count	20	5	25
		% within scale	80.0%	20.0%	100.0%
		% within Nationality	39.2%	9.8%	24.5%
		% of Total	19.6%	4.9%	24.5%
	probably not	Count	16	21	37
		% within scale	43.2%	56.8%	100.0%
		% within Nationality	31.4%	41.2%	36.3%
		% of Total	15.7%	20.6%	36.3%
no	Count	7	21	28	
	% within scale	25.0%	75.0%	100.0%	
	% within Nationality	13.7%	41.2%	27.5%	
	% of Total	6.9%	20.6%	27.5%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 4: Does agriculture as currently practiced compromise the ability of future generation to meet their own needs?

Does agriculture as currently practiced compromise the ability of future generations to meet their own needs?



Indian respondents (42 out of 51) do not see current practices in agriculture as seriously threatening future development while Czech respondents (28 out of 51) perceive the development rather negatively. It points at more pessimistic expectations of Czech respondents and optimistic expectations of Indian respondents. In the Indian case, the perceptions may be given historically; people experienced a long-standing food crisis until the 1970s when it was greatly resolved with improved agricultural productivity and India became self-sufficient in feeding its own population (Wikipedia, 2011). In the Czech case, the country is to a great extent dependent on imports of agricultural products from other countries, and the agricultural land is decreasing dramatically, so it may be a possible reason for the Czechs to be concerned, that they are not self-sufficient in food production. As shown in the responses to question 2, many Czech respondents perceive the release of harmful substances into nature to be as a serious negative effect of agriculture. This may reflect a negative trend for the future, if Czechs in general also view agriculture to be environmentally harmful.

4.4. Section 2: SUSTAINABLE DEVELOPMENT

One of the underlying factors that is important for sustainable development are the values that people hold; what they consider to be the most important for their lives and life on the planet, whether it be more of an economic, or social, or environmental character. Question 6 is designed to find out in which of these three pillars weighs most heavily in the values of people.

Question 7 asks how current codes of conduct, moral values, laws and international agreements are perceived in terms of providing effective measures for economic development, social justice, and environment protection.

In question 8, students were asked to express what they believe the government should pay the most attention to. It is expected that the answers are compatible with the answers to question 7. Question 9 tries to uncover respondents' perceptions regarding responsibility for the current state of the environment.

Question 6

In the following list, please tick those 3 items that you consider the most important for you:

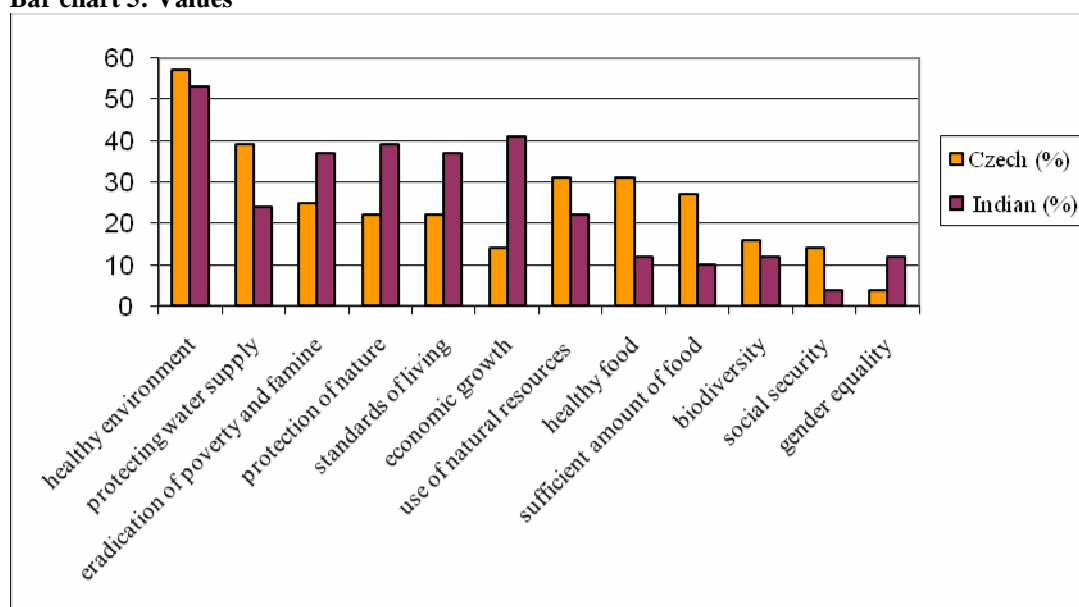
- *healthy environment*
- *better standards of living*
- *economic growth*
- *use of natural resources in a renewable way*
- *protection of nature*
- *healthy food*
- *eradication of poverty and famine*
- *biodiversity*
- *protecting the drinking water supply*
- *sufficient amount of food*
- *social security*
- *gender equality*

The summary of responses of total number of respondents is in the following table in the descending order from the highest scoring item to the lowest scoring. As requested each respondent ticked exactly 3 boxes.

Table 12: Values

	Order (C.)	Czech (%)	Order (I.)	Indian (%)	Total (%)
Healthy environment	1	57	1	53	110
Protecting the drinking water supply	2	39	6	24	63
Eradication of poverty and famine	6	25	4-5	37	62
Protection of nature	7-8	22	3	39	61
Better standards of living	7-8	22	4-5	37	59
Economic growth	10-11	14	2	41	55
Use of natural resources in a renewable way	3-4	31	7	22	53
Healthy food	3-4	31	8-10	12	43
Sufficient amount of food	5	27	11	10	37
Biodiversity	9	16	8-10	12	28
Social security	10-11	14	12	4	18
Gender equality	12	4	8-10	12	16

Bar chart 5: Values



The aim of this question was to find out, based on the ranking, what people value the most and what are the differences in ranking between Czech and Indian respondents. It is assumed that values usually determine how people behave and act. However, this work

does not aim to study human values and behavior in different countries in detail; that is a subject of psychology. The findings serve as a very basic guidance for investigation.

There is an agreement between Czechs and Indians about a *Healthy environment*; it scored the highest percentage in both countries. The question, however, is whether they perceive themselves as responsible for conditions of the environment or as just passive users of its services. According to the results of question 9, regarding responsibility for burdens on the planetary ecosystems caused by economic activities, it appears that Indian respondents perceive themselves as actors who have a greater responsibility for the environment they live in, compared to Czech respondents, who though they also highly value a healthy environment, do not feel responsible for the environmental problems. It has been observed, that Czech people tend to complain but remain inactive.

The further differences in ranking between Czech and Indian respondent groups point at the broad variety of what people strive for, depending on the current state of their development. There is no general agreement as to the most important thing in one's life. In the developed countries, in their current state, people have very complex needs that are mutually interconnected. The needs are not a matter only of physical survival in terms of food, shelter and safety. In the developing world, the needs and values may be much simpler, fulfilled solely by food and shelter.

Perceptions about codes of conduct, moral values, laws, and international agreements

It can be asserted that development is supported, hindered or directed by codes of conduct, moral values, laws and agreements between nations. The following set of questions aims to find out whether these are effective measures for sustainable development.

Question 7

Do current codes of conduct, moral values, laws, and international agreements provide effective measures for:

- *environment protection,*
- *economic development,*
- *and social justice?*

Table 13: Do current codes of conduct, moral values, laws, and international agreements provide effective measures for environment protection?

			Nationality		Total
			Czech	Indian	
Scale	yes	Count	1	0	1
		% within scale	100.0%	.0%	100.0%
		% within Nationality	2.0%	.0%	1.0%
		% of Total	1.0%	.0%	1.0%
	possibly	Count	18	8	26
		% within scale	69.2%	30.8%	100.0%
		% within Nationality	35.3%	15.7%	25.5%
		% of Total	17.6%	7.8%	25.5%
	probably not	Count	27	9	36
		% within scale	75.0%	25.0%	100.0%
		% within Nationality	52.9%	17.6%	35.3%
		% of Total	26.5%	8.8%	35.3%
no	Count	5	34	39	
	% within scale	12.8%	87.2%	100.0%	
	% within Nationality	9.8%	66.7%	38.2%	
	% of Total	4.9%	33.3%	38.2%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Both the Czech and Indian respondent groups were rather pessimistic about the effectiveness of current measures for environmental protection. However, Czech respondents do not perceive it as negatively as Indian students, where 67% answered a clear ‘no’ as to the effectiveness of current measures for environmental protection. The Czech Republic, as a part of the European Union, is under stricter regulations regarding the environment than the Republic of India, and people may perceive the measures as effective.

Bar chart 6: Environment protection

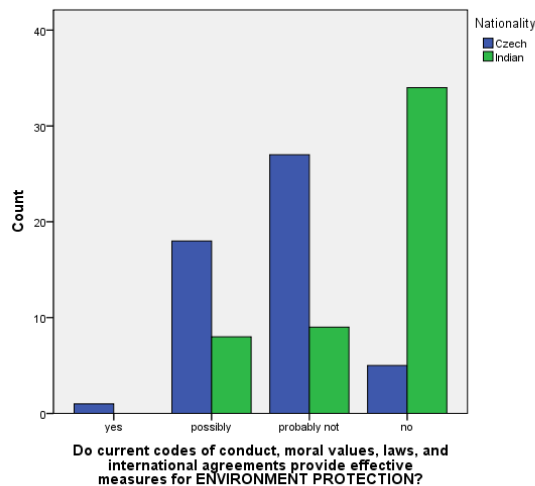
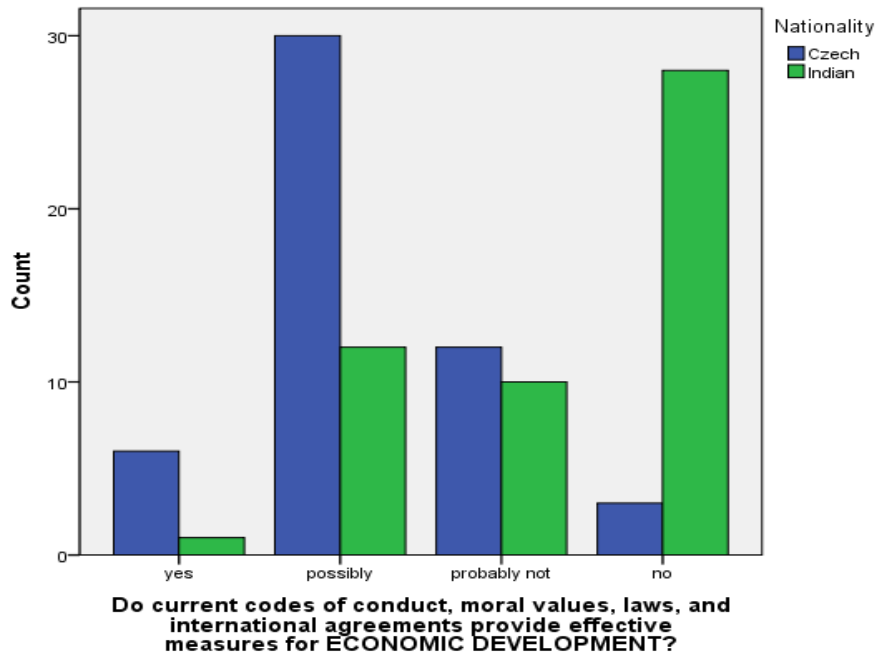


Table 14: Do current codes of conduct, moral values, laws, and international agreements provide effective measures for economic development?

			Nationality		Total
			Czech	Indian	
Scale	yes	Count	6	1	7
		% within scale	85.7%	14.3%	100.0%
		% within Nationality	11.8%	2.0%	6.9%
		% of Total	5.9%	1.0%	6.9%
	possibly	Count	30	12	42
		% within scale	71.4%	28.6%	100.0%
		% within Nationality	58.8%	23.5%	41.2%
		% of Total	29.4%	11.8%	41.2%
	probably not	Count	12	10	22
		% within scale	54.5%	45.5%	100.0%
		% within Nationality	23.5%	19.6%	21.6%
		% of Total	11.8%	9.8%	21.6%
no	Count	3	28	31	
	% within scale	9.7%	90.3%	100.0%	
	% within Nationality	5.9%	54.9%	30.4%	
	% of Total	2.9%	27.5%	30.4%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 7: Economic development



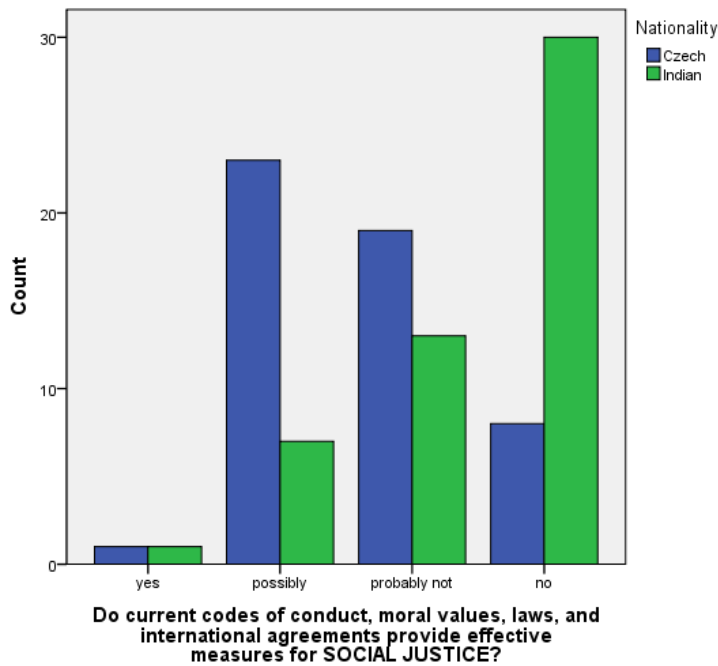
58% of the Czech students, in the contrast to Indian students, believe that current codes of conduct, moral values, laws, and international agreements possibly provide effective measures for economic development. The majority of the Indian respondents, 55%, do not believe in their effectiveness. Altogether, the highest scoring point from the scale, for both groups together, with 41%, was that current measures are possibly effective for economic development.

The third question is about social justice. It is not the aim of this paper to find out what people understand by social justice itself. There are many definitions based on a variety of factors, like political orientation, religious background, and political and social philosophy (Christensen, 2011).

Table 15: Do current codes of conduct, moral values, laws, and international agreements provide effective measures for social justice?

			Nationality		Total
			Czech	Indian	
Scale	yes	Count	1	1	2
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	2.0%	2.0%	2.0%
		% of Total	1.0%	1.0%	2.0%
	possibly	Count	23	7	30
		% within scale	76.7%	23.3%	100.0%
		% within Nationality	45.1%	13.7%	29.4%
		% of Total	22.5%	6.9%	29.4%
	probably not	Count	19	13	32
		% within scale	59.4%	40.6%	100.0%
		% within Nationality	37.3%	25.5%	31.4%
		% of Total	18.6%	12.7%	31.4%
no	Count	8	30	38	
	% within scale	21.1%	78.9%	100.0%	
	% within Nationality	15.7%	58.8%	37.3%	
	% of Total	7.8%	29.4%	37.3%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 8: Social justice



Measures for social justice, as one of the three main pillars of sustainability, were perceived as possibly efficient by 45% of Czech students, while 59% of Indian students stated that they are not efficient.

Evaluation of perceptions about codes of conduct, moral values, laws, and international agreements

The Indian respondents were in all three aspects of sustainability negative about the efficiency of current measures, such as codes of conduct, moral values, laws, and international agreements, while Czech respondents were pessimistic about the measures regarding the environment protection and slightly more optimistic about economic growth and social justice.

With respect to sustainable development, based on the results it can be assumed that Indian respondents do not find the current measures to be an efficient tool, thus a move towards sustainability may be hindered.

The Czech respondents are the most optimistic about the efficacy of measures for economic development and the least about environmental protection. Based on the literature review, natural capital (a part of the environmental pillar) is an essential foundation for economic growth and social stability. According to the results, current measures cannot be regarded overall as efficient enough to support sustainability for the Czech respondents, due to a lack of environmental protection.

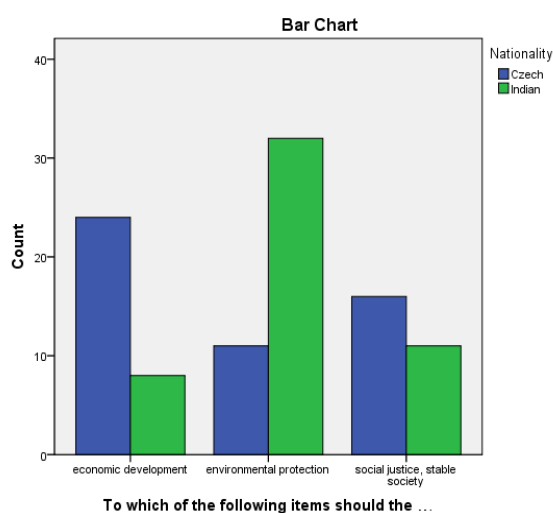
Question 8

To which of the following items should the government pay the most attention?

Table 16: To which of the following items should the government pay the most attention?

			Nationality		Total
			Czech	Indian	
Items	Economic development	Count	24	8	32
		% within item	75.0%	25.0%	100.0%
		% within Nationality	47.1%	15.7%	31.4%
		% of Total	23.5%	7.8%	31.4%
	Environmental protection	Count	11	32	43
		% within item	25.6%	74.4%	100.0%
		% within Nationality	21.6%	62.7%	42.2%
		% of Total	10.8%	31.4%	42.2%
	Social justice, stable society	Count	16	11	27
		% within item	59.3%	40.7%	100.0%
		% within Nationality	31.4%	21.6%	26.5%
		% of Total	15.7%	10.8%	26.5%
Total		Count	51	51	102
		% within item	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Bar chart 9: To which of the following items should the government pay the most attention?



In contrast to opponents of environmentalism, Kudrna has stated that environmental protection by the government is needed and not only from governments acting singly but through international cooperation, since environmental issues transcend borders. The productive capacity of the natural resource base should be maintained and, where possible, enhanced (2011).

Indian respondents (63%) think that the government should pay the most attention to environmental protection, followed by social justice and stable society (22%), and finally economic development (15%).

Czech respondents think that the government should pay the most attention to economic development (47%), followed by social justice and stable society (31%), and finally environmental protection (22%).

According to Librova (1987), and verified by Indian students living in the Czech Republic, Indian people see the world holistically, perceiving themselves as a part of nature. The environment should be the priority, they say, since otherwise there is no possibility for long-term development. In the European understanding of nature, strongly influenced by antique and Christian culture, social consciousness was oriented towards possessing the world. People who think and feel things in a European way see nature predominantly as a carrier of functions, which are of some importance for them. Oriental culture and oriental philosophy were oriented rather to the passive adjustment of men to nature (Librova, 1987).

The findings from question 9 also prove the different approaches between Indian and Czech understanding.

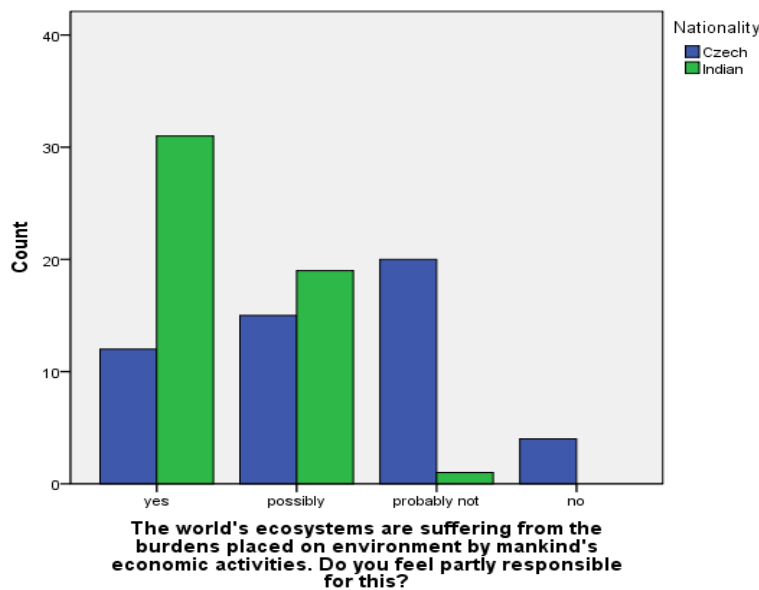
Question 9

The world's ecosystems are suffering from the burdens placed on environment by mankind's economic activities. Do you feel partly responsible for this?

Table 17: The world's ecosystems are suffering from the burdens placed on environment by mankind's economic activities. Do you feel partly responsible for this?

Data table			Nationality		Total
			Czech	Indian	
Scale	yes	Count	12	31	43
		% within scale	27.9%	72.1%	100.0%
		% within Nationality	23.5%	60.8%	42.2%
		% of Total	11.8%	30.4%	42.2%
	possibly	Count	15	19	34
		% within scale	44.1%	55.9%	100.0%
		% within Nationality	29.4%	37.3%	33.3%
		% of Total	14.7%	18.6%	33.3%
	probably not	Count	20	1	21
		% within scale	95.2%	4.8%	100.0%
		% within Nationality	39.2%	2.0%	20.6%
		% of Total	19.6%	1.0%	20.6%
no	Count	4	0	4	
	% within scale	100.0%	.0%	100.0%	
	% within Nationality	7.8%	.0%	3.9%	
	% of Total	3.9%	.0%	3.9%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 10: Responsibility



50 out of 51 Indian respondents feel at least partly responsible for burdens placed on the environment, whereas only 27 of the Czech respondents feel at least partly responsible, and 24 do not perceive themselves as responsible.

This question could be understood from two different perspectives - from an individual's point of view and from a nation's point of view.

From the perspective of the nation, India is a large country and the Czech Republic is a small country, so the shares of responsibility for the world ecosystem's damage may be perceived as adequate to the size of a country. In this case, the assumption would be proved by the results.

From the perspective of an individual, with every action we do (consciously or unconsciously) every day, we make a choice as to whether we contribute to the burdens on the environment or whether we decide to be considerate and respectful to nature and to other human beings. We can consciously choose products and services produced in a sustainable manner and thus contribute to a better society. Such behavior demands certain values and education, which are usually reflections of a culture. In his book, White (1967) compares Christianity with other world religions and claims that Christianity is "the most anthropogenic religion in the world". Nowhere else is there such a sharp division line between man and nature. This makes it easier for Christian oriented cultures to exploit nature. European culture, of which Czech culture is a part, is based on Christianity. This may be a reason why Czech respondents do not as much feel responsibility for the environmental problems caused by man as do the Indian respondents. In India, people are brought up with a sense, that they all are interconnected with nature, and its laws are superior to those of man. The idea of man living in harmony with nature and of people respecting one another is deeply seated in people in India.

4.5. Section 4: SUSTAINABLE AGRICULTURE

This section is organized along 3 main questions:

- Is sustainable agriculture achievable?
- What is the most important for sustainable agriculture?
- What would most effectively encourage a move towards sustainable agriculture?

The first set of questions (in question 10) aims to find out whether students believe that sustainable agriculture is achievable and what dimension is perceived to have the biggest potential in such efforts.

Question 10

Sustainable agriculture is achievable:

- *economically (through economic incentives, subsidies, etc.)*
- *ecologically*
- *through social change (e.g. politics, regulations, etc.)*
- *technically*

Table 18: Sustainable agriculture is achievable economically

			Nationality		Total
			Czech	Indian	
Scale	strongly agree	Count	3	6	9
		% within scale	33.3%	66.7%	100.0%
		% within Nationality	5.9%	11.8%	8.8%
		% of Total	2.9%	5.9%	8.8%
	agree	Count	9	33	42
		% within scale	21.4%	78.6%	100.0%
		% within Nationality	17.6%	64.7%	41.2%
		% of Total	8.8%	32.4%	41.2%
	somewhat agree	Count	18	10	28
		% within scale	64.3%	35.7%	100.0%
		% within Nationality	35.3%	19.6%	27.5%
		% of Total	17.6%	9.8%	27.5%
	somewhat disagree	Count	18	1	19
		% within scale	94.7%	5.3%	100.0%
		% within Nationality	35.3%	2.0%	18.6%
		% of Total	17.6%	1.0%	18.6%
	disagree	Count	2	1	3
		% within scale	66.7%	33.3%	100.0%
		% within Nationality	3.9%	2.0%	2.9%
		% of Total	2.0%	1.0%	2.9%
strongly disagree	Count	1	0	1	
	% within scale	100.0%	.0%	100.0%	
	% within Nationality	2.0%	.0%	1.0%	
	% of Total	1.0%	.0%	1.0%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

65% of the Indian respondents think that sustainable agriculture is possible to achieve economically. The Czech respondents were evenly divided on the question, with 35% saying they somewhat agreed and 35% that they somewhat disagreed.

The following table and bar chart present the agreements with a statement, that sustainable agriculture is achievable ecologically.

Table 19: Sustainable agriculture is achievable ecologically

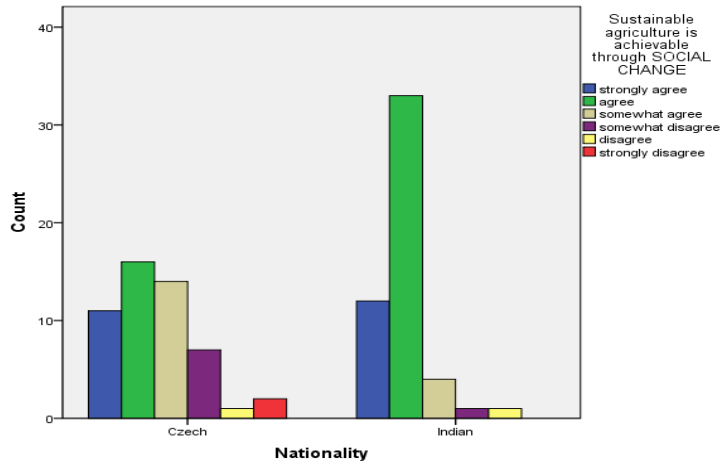
			Nationality		Total
			Czech	Indian	
Scale	strongly agree	Count	6	7	13
		% within scale.	46.2%	53.8%	100.0%
		% within Nationality	11.8%	13.7%	12.7%
		% of Total	5.9%	6.9%	12.7%
	agree	Count	14	37	51
		% within scale	27.5%	72.5%	100.0%
		% within Nationality	27.5%	72.5%	50.0%
		% of Total	13.7%	36.3%	50.0%
	somewhat agree	Count	13	5	18
		% within scale	72.2%	27.8%	100.0%
		% within Nationality	25.5%	9.8%	17.6%
		% of Total	12.7%	4.9%	17.6%
	somewhat disagree	Count	13	2	15
		% within scale	86.7%	13.3%	100.0%
		% within Nationality	25.5%	3.9%	14.7%
		% of Total	12.7%	2.0%	14.7%
	disagree	Count	3	0	3
		% within scale	100.0%	.0%	100.0%
		% within Nationality	5.9%	.0%	2.9%
		% of Total	2.9%	.0%	2.9%
strongly disagree	Count	2	0	2	
	% within scale.	100.0%	.0%	100.0%	
	% within Nationality	3.9%	.0%	2.0%	
	% of Total	2.0%	.0%	2.0%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

The majority of both Czech and Indian students believe that sustainable agriculture is achievable ecologically.

Table 20: Sustainable agriculture is achievable through social change

			Nationality		Total
			Czech	Indian	
Scale	strongly agree	Count	11	12	23
		% within scale	47.8%	52.2%	100.0%
		% within Nationality	21.6%	23.5%	22.5%
		% of Total	10.8%	11.8%	22.5%
	agree	Count	16	33	49
		% within scale	32.7%	67.3%	100.0%
		% within Nationality	31.4%	64.7%	48.0%
		% of Total	15.7%	32.4%	48.0%
	somewhat agree	Count	14	4	18
		% within scale	77.8%	22.2%	100.0%
		% within Nationality	27.5%	7.8%	17.6%
		% of Total	13.7%	3.9%	17.6%
	somewhat disagree	Count	7	1	8
		% within scale	87.5%	12.5%	100.0%
		% within Nationality	13.7%	2.0%	7.8%
		% of Total	6.9%	1.0%	7.8%
	disagree	Count	1	1	2
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	2.0%	2.0%	2.0%
		% of Total	1.0%	1.0%	2.0%
strongly disagree	Count	2	0	2	
	% within scale	100.0%	.0%	100.0%	
	% within Nationality	3.9%	.0%	2.0%	
	% of Total	2.0%	.0%	2.0%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 11: social change



It is believed by the majority of respondents that sustainable agriculture is achievable through social change. Kudrna agrees that in order to improve the situation in agriculture, governments of European countries should cooperate and based on comparative advantages in the production of food and fibers, they should divide their activities for the wellbeing of all countries.

Table 21: Sustainable agriculture is achievable technically.

			Nationality		Total
			Czech	Indian	
Scale	strongly agree	Count	6	9	15
		% within scale	40.0%	60.0%	100.0%
		% within Nationality	11.8%	17.6%	14.7%
		% of Total	5.9%	8.8%	14.7%
	agree	Count	13	33	46
		% within scale	28.3%	71.7%	100.0%
		% within Nationality	25.5%	64.7%	45.1%
		% of Total	12.7%	32.4%	45.1%
	somewhat agree	Count	22	6	28
		% within scale	78.6%	21.4%	100.0%
		% within Nationality	43.1%	11.8%	27.5%
		% of Total	21.6%	5.9%	27.5%
	somewhat disagree	Count	8	2	10
		% within scale	80.0%	20.0%	100.0%
		% within Nationality	15.7%	3.9%	9.8%
		% of Total	7.8%	2.0%	9.8%
disagree	Count	2	1	3	
	% within scale	66.7%	33.3%	100.0%	
	% within Nationality	3.9%	2.0%	2.9%	
	% of Total	2.0%	1.0%	2.9%	
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

According to the results of the questionnaire, most of the students believe that sustainable agriculture is achievable on economical, environmental, social, and technical levels. There is a certain discrepancy between such answers and the results of question 8 about current measures, where respondents did not see current codes of conduct, moral values, laws, and international agreements as effective measures for any single dimension of sustainability. It may be argued that, although the current measures are not effective, the sustainable development has the potential to be achieved.

49% of Indian students think that scientific research and development is the most important for sustainable agriculture (table 22) as well as for technological change (table 23). 45% of Czech students think that it is interest from society that is the most important (table 22) as well as education and higher awareness about negative implications of development of life (table 23).

Question 11

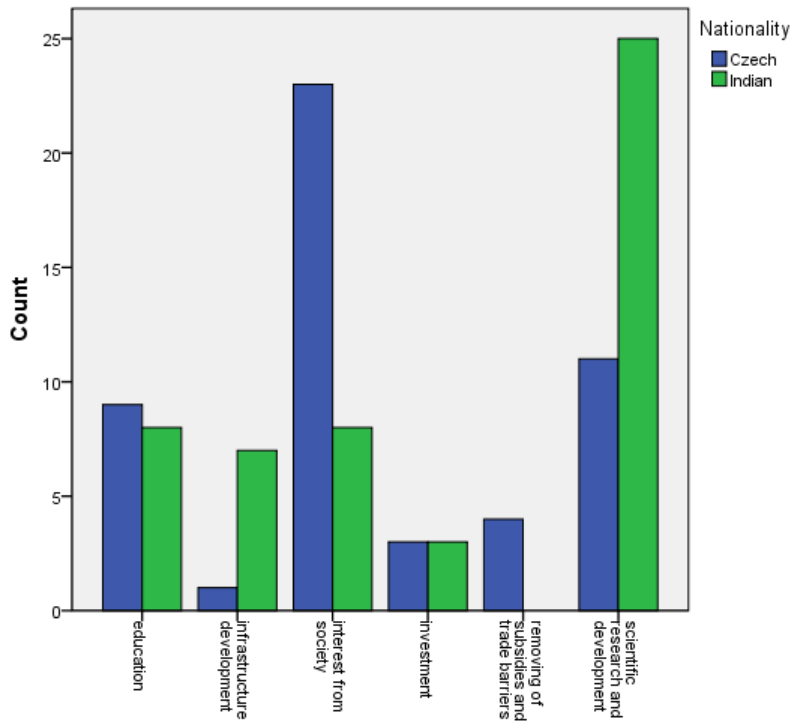
Which of the following is the most important for sustainable agriculture?

- *scientific research and development*
- *investment*
- *infrastructure development*
- *education*
- *interest from society*
- *removing harmful subsidies and trade barriers*

Table 22: Which of the following is the most important for sustainable agriculture?

			Nationality		Total
			Czech	Indian	
Items	Education	Count	9	8	17
		% within item	52.9%	47.1%	100.0%
		% within Nationality	17.6%	15.7%	16.7%
		% of Total	8.8%	7.8%	16.7%
	Infrastructure development	Count	1	7	8
		% within item	12.5%	87.5%	100.0%
		% within Nationality	2.0%	13.7%	7.8%
		% of Total	1.0%	6.9%	7.8%
	Interest from society	Count	23	8	31
		% within item	74.2%	25.8%	100.0%
		% within Nationality	45.1%	15.7%	30.4%
		% of Total	22.5%	7.8%	30.4%
	Investment	Count	3	3	6
		% within item	50.0%	50.0%	100.0%
		% within Nationality	5.9%	5.9%	5.9%
		% of Total	2.9%	2.9%	5.9%
	Removing of subsidies and trade barriers	Count	4	0	4
		% within item	100.0%	.0%	100.0%
		% within Nationality	7.8%	.0%	3.9%
		% of Total	3.9%	.0%	3.9%
	Scientific research and development	Count	11	25	36
		% within item	30.6%	69.4%	100.0%
		% within Nationality	21.6%	49.0%	35.3%
		% of Total	10.8%	24.5%	35.3%
Total		Count	51	51	102
		% within items	50.0%	50.0%	100.0%
		% within Nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Bar chart 12: Which of the following is the most important for sustainable agriculture?



Kudrna agrees that scientific research in agriculture should be strongly encouraged. With rising population levels, he notes production also has to rise and one way to do so is through intensified farming. More scientific research needs to be done so that the land is used more efficiently and production increases while at the same time the technologies do not degrade the environment.

The Indian respondents put technological change in the first place of things needed to encourage a move towards sustainable agriculture (question 12). The Czech respondents think that the most effective measure would be education and higher awareness about negative implications of development on life.

Question 12

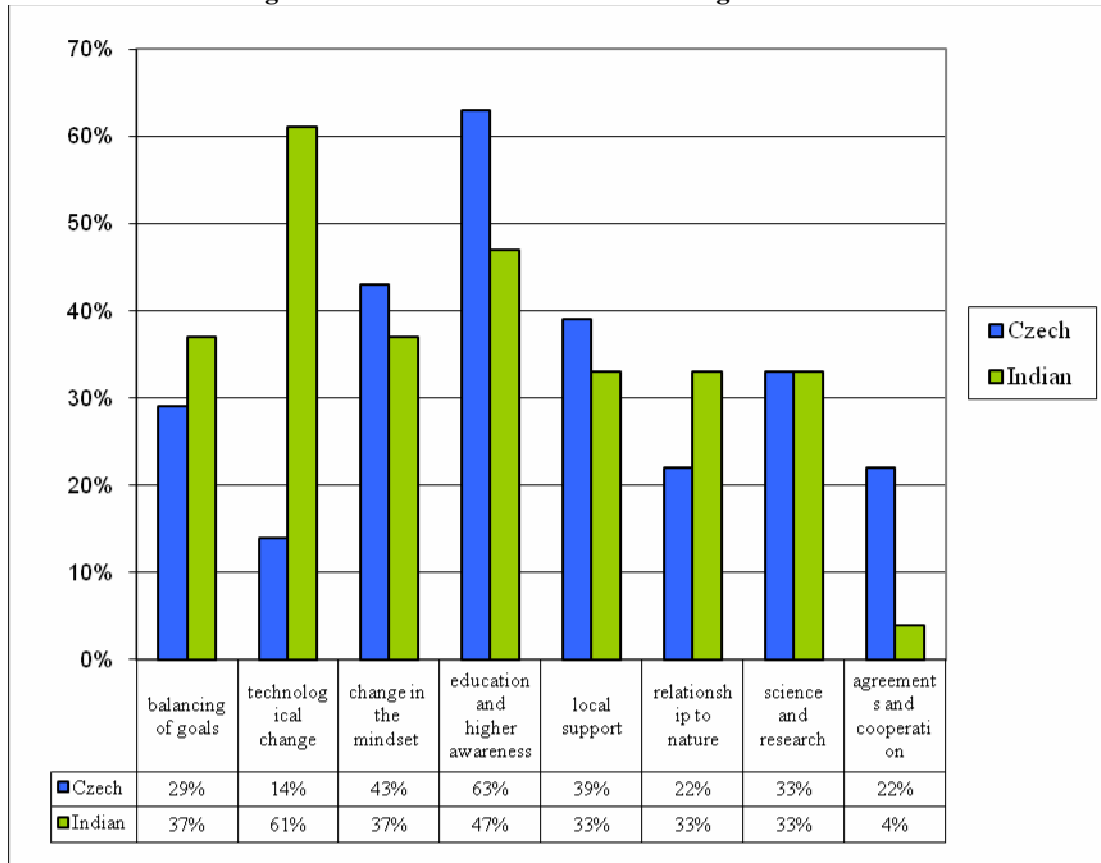
What would most effectively encourage a move towards sustainable agriculture?

- *careful balancing of long-term and short-term goals*
- *technological change*
- *maturity, empathy, wisdom of people, i.e. change in the mindset of people*
- *education and higher awareness about negative implications of development on life*
- *local farming communities support*
- *positive relationship to nature*
- *more extensive findings in the area of science and research*
- *more effective international agreements and cooperation*

Table 23: What would most effectively encourage a move towards sustainable agriculture?

	Czech (%)	Indian (%)	Total (%)
Education and awareness about negative implic. Of development on life	63	47	110
Maturity, empathy, wisdom of people, i.e. Change in the mindset of people	43	37	80
Technological change	14	61	75
Local farming communities support	39	33	72
Careful balancing of long-term and short-term goals	29	37	66
More extensive findings in the area of science and research	33	33	66
Positive relationship to nature	22	33	55
More effective international agreements and cooperation	22	4	26

Bar chart 13: Encouragement of a move towards sustainable agriculture



From the author’s own observations and experience, Czech people do not show much interest in agriculture and related environmental issues. If the interest of society were increased through education and there arose a greater awareness of the negative implications of development on life, people’s behavior could be changed significantly, making them more conscious in their consumption and turning businesses from unsustainable processes to processes that are regarded as more sustainable.

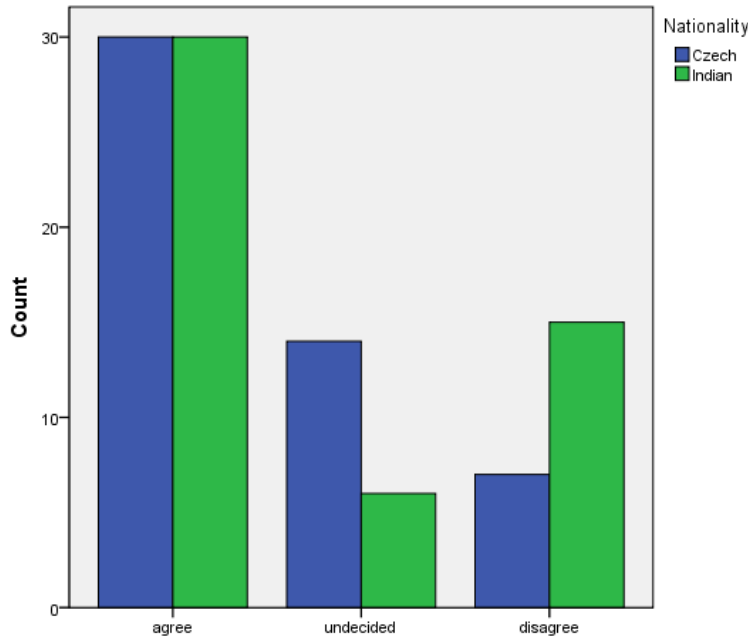
Question 13

Sustainable agriculture will be successful only to the extent that it is profitable.

Table 24: Sustainable agriculture will be successful only to the extent that it is profitable.

			Nationality		Total
			Czech	Indian	
Scale	agree	Count	30	30	60
		% within scale	50.0%	50.0%	100.0%
		% within Nationality	58.8%	58.8%	58.8%
		% of Total	29.4%	29.4%	58.8%
	undecided	Count	14	6	20
		% within scale	70.0%	30.0%	100.0%
		% within Nationality	27.5%	11.8%	19.6%
		% of Total	13.7%	5.9%	19.6%
	disagree	Count	7	15	22
		% within scale	31.8%	68.2%	100.0%
		% within Nationality	13.7%	29.4%	21.6%
		% of Total	6.9%	14.7%	21.6%
Total	Count	51	51	102	
	% within scale	50.0%	50.0%	100.0%	
	% within Nationality	100.0%	100.0%	100.0%	
	% of Total	50.0%	50.0%	100.0%	

Bar chart 14: Sustainable agriculture will be successful only to the extent that it is profitable



Sustainable agriculture will be successful only to the extent that it is profitable.

Profitability is definitely amongst the first priorities of any economic activity. Most of the definitions link sustainable agriculture with economic acceptability for both farmers and customers on the basis of current criteria and habits. However, according to Natr, the priority of respect to laws of nature must be on such level that we carry the consequences of economic activities without regards to current prices or profits (2004).

Question 14

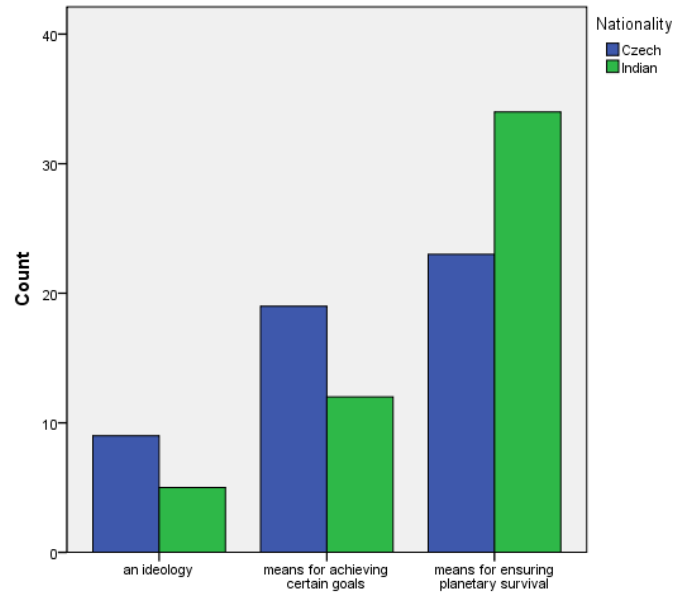
I perceive sustainable development primarily as:

- *an ideology*
- *means for achieving certain goals*
- *means for ensuring planetary survival*

Table 25: Sustainable development as an ideology, means for achieving certain goals, means for ensuring planetary survival.

			Nationality		Total
			Czech	Indian	
Items	An ideology	Count	9	5	14
		% within item	64.3%	35.7%	100.0%
		% within Nationality	17.6%	9.8%	13.7%
		% of Total	8.8%	4.9%	13.7%
	Means for achieving certain goals	Count	19	12	31
		% within item	61.3%	38.7%	100.0%
		% within Nationality	37.3%	23.5%	30.4%
		% of Total	18.6%	11.8%	30.4%
	Means for ensuring planetary survival	Count	23	34	57
		% within item	40.4%	59.6%	100.0%
		% within Nationality	45.1%	66.7%	55.9%
		% of Total	22.5%	33.3%	55.9%
Total	Count		51	51	102
	% within item		50.0%	50.0%	100.0%
	% within Nationality		100.0%	100.0%	100.0%
	% of Total		50.0%	50.0%	100.0%

Bar chart 15: Sustainable development as an ideology, means for achieving certain goals, means for ensuring planetary survival.



Most of the respondents (45% of Czech and 67% of Indian) perceive sustainable development as a means for ensuring planetary survival, followed by a means for achieving certain goals (37% of Czechs and 24% of Indians), and least importantly, as an ideology (18% of Czechs and 10% of Indians). This points at certain imperativeness for making development sustainable for the current and future generations. However, as Heilig (1997) argues, there is no methodological schema that would facilitate measurements and would organize and order levels of sustainability of individual processes. Scientific methods for quantifying degrees of sustainability are much needed.

5. Conclusions

Agriculture has a vital function in meeting the basic needs of human society, such as producing food by the growing of crops and breeding of animals. Besides production, agriculture serves many other purposes that refer to a whole range of social, economic, and environmental functions associated with agriculture and related land-use. Recognizing the multiple functions of agriculture, so-called “multifunctional agriculture”, is a stepping stone to sustainable agriculture.

Sustainable agriculture covers a number of different approaches. All try in one way or the other to achieve environmentally non-degrading, socially acceptable, economically viable and technically appropriate forms of land husbandry in order to ensure the attainment and continued satisfaction of human needs for present and future generations.

However, meeting the needs of people in both the present and the future is becoming a global challenge. It is a matter of fact that the future generations will take over the planet in a different condition than their predecessors; with more people to feed, higher pollution levels, decreasing reservoirs of drinking water, largely depleted soils, and so forth. All parts of the world are affected. The interconnectedness of the planet’s systems is becoming more and more obvious.

There is no general agreement on how to resolve such global issues. The concept of sustainable development aims to find ways to optimize the balance between the three interrelated dimensions – environmental, social, and economic. However, measuring the degrees of sustainability of individual processes remains very complicated, given that the processes are very complex and people’s understanding of the concept of sustainability varies. It appears that perceptions about sustainable development differ from country to country, given the different social, environmental, and economic conditions in each country.

The main aim of this work was to investigate how the concept of sustainability, and in particular sustainable agriculture, is perceived by Czech and Indian students. The research was done through questionnaires. The empirical section was organized into three

interrelated sections: Agriculture and its importance, sustainable development, and sustainable agriculture.

Based on the findings in the first section, it appears that the Indian respondents acknowledge the importance of agriculture more strongly than do the Czech respondents. This is most noticeable from the answers about the multiple functions of agriculture. The difference in the evaluations between the two respondent groups may reflect the very different role that agriculture plays in these two countries. In the Czech Republic, agriculture is decreasing in importance and currently it accounts for only about 2% of GDP. Agriculture in India is a major employer and is the biggest economic sector in terms of its share of that country's GDP.

As with most economic activities, agriculture has both negative and positive effects. Deforestation was perceived as the most negative effect of conventional agriculture by both of the respondent groups. This effect has also been classified as the most serious by a scientist Prof. Karel Kudrna DrCs. Indian respondents perceived the threat posed by conventional agriculture as an endangerment to rural areas. Most Indian citizens are rural people dependent on agriculture. Agricultural practices that do not take into account rural communities and the environment have large negative implications for India. Many of the Czech respondents perceive as a negative effect the release of harmful agricultural substances into nature. High productivity of conventional agriculture and providing food for a large population was ranked among the biggest positive effects by both the Czech and the Indian respondents. However, it is necessary to find ways how to feed the world while at the same time not endangering mankind's existence through environmentally harmful activities.

While the Czech respondents think that agriculture meets their current needs, they are not so optimistic about the future. Even though the Indian respondents are not very strongly convinced that agriculture meets their current needs, with respect to their expectations for the future the Indian respondents are optimistic that future generations will be able to meet their own needs.

The underlying factors for sustainable development are human values; they usually determine how people behave and act. Both the Czech and Indian respondents value a healthy environment, placing it in first place. However, current codes of conduct, moral

values, laws, and international agreements are not perceived by either of the two groups as providing effective measures for environment protection. The Indian respondents believe that government should pay the most attention to environmental protection, while the Czech respondents believe that government should pay the most attention to economic development.

The responses to the questionnaires indicate that the Czech respondents are more economically oriented than the Indian respondents. The Indian respondents believe that the environment should be the top priority. Many Indians tend to see the world in holistic terms: Man is a part of nature and the laws of nature must be superior to the actions taken by man or else civilization will collapse. The Indian respondents perceive that they are partially responsible for the world's ecosystems and that they are suffering from the burdens placed on the environment by mankind's economic activities. The Czech respondents do not seem to feel very strongly responsible. This is perhaps a cultural difference: In the European way of thinking, man tends to be separated from nature and superior to it.

Both respondent groups think that sustainable agriculture is achievable technically and in all three dimensions of sustainable development – economically, ecologically, and through social change. Social change appears to have the biggest potential for achieving sustainable agriculture, according to the results. Environmental issues, which are one of the most serious current problems, are considered to be of a mostly social character. Solving the social issues is a possible way out of the so-called ecological crisis.

The Czech respondents believe that a move towards sustainable agriculture would be most effectively encouraged by education to raise awareness about the negative implications that economic development can have on life. That could significantly change the behavior of people, making them consume goods and services produced in more sustainable ways.

The Indian respondents feel that a move towards sustainable agriculture would be most effectively encouraged by technological change, especially through encouraging scientific research and development. Most Indian people are directly linked to agriculture and they are dedicated to it. It appears from the answers of the Indian respondents that they care about the environment and social development. What they feel is most lacking is

scientific research that would provide adequate technology to achieve sustainable agriculture.

Sustainable development is perceived by the majority of respondents as a means for ensuring planetary survival. People need food to survive. Food is provided by agriculture. To make agriculture sustainable is necessary for the further development of human civilization.

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Figure 3: *The characteristics of conventional and ecological understandings of relationships between man and nature:* Lacko/Bartosova, M. a kol.: *Udrzatelne a ekologické poľnohospodárstvo*, SPU Nitra, 2005. Available at: http://home.zf.jcu.cz/~moudry/multif_zemedelstvi/frvs_pdf/2_TUZ.pdf

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7. Supplements:

Sustainable agriculture and its perceptions amongst Czech and Indian students

Dear Sir/Madam,

I am an MSc student at the Czech University of Life Sciences in Prague, majoring in Economics and Management. Currently, I am writing my diploma thesis on the topic: "Sustainable agriculture and its perceptions amongst Czech and Indian students".

I would like to kindly ask you to fill in the following questionnaire. Please, read the questions carefully before you answer them.

Your answers will be used for my diploma thesis only. If you would like I will be happy to provide you with the results of the research.

Thank you very much for your help.

Andrea Polakova

* Required

Nationality *

Indian

Sex *

Female

Nowadays, there are frequent discussions about the multiple functions of agriculture. How would you rank the following functions of agriculture on the scale of importance? *

	very important	important	moderately important	not important	not important at all
agriculture functions as a caretaker of the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
agriculture functions as a food producer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
agriculture functions as a reservoir of renewable resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
agriculture has an esthetical function (maintaining the beauty of the traditional landscape)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
agriculture has an educational function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
agriculture has a recreational function (e.g. agro-tourism)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What do you consider to be the most serious negative effect of agriculture? *

Please, tick a maximum of 3 boxes.

- global warming
- deforestation
- extensive changes in underground water levels
- harmful substances release into nature
- population migration
- poverty and famine
- endangering rural areas

What do you consider to be the biggest positive effect of modern conventional agriculture? *

*

Please, tick 1 box

- high productivity
- high economic returns
- it is progressive
- it provides food for a large population
- it is sustainable

Does agriculture meet the needs of the current generation? *

- yes
- possibly
- probably not
- no

Does agriculture as currently practiced compromise the ability of future generations to meet their own needs? *

- yes
- possibly
- probably not
- no

In the following list, please tick those 3 items that you consider the most important for you:

*

please tick 3 items

- healthy environment
- better standards of living
- economic growth
- use of natural resources in a renewable way
- protection of nature
- healthy food
- eradication of poverty and famine
- biodiversity
- protecting the drinking water supply
- sufficient amount of food
- social security
- gender equality

To which of the following items should the government pay the most attention? *

- environmental protection
- economic development
- social justice, stable society

Do current codes of conduct, moral values, laws, and international agreements provide effective measures for ENVIRONMENT PROTECTION? *

- yes
- possibly
- probably not
- no

Do current codes of conduct, moral values, laws, and international agreements provide effective measures for ECONOMIC DEVELOPMENT? *

- yes
- possibly
- probably not
- no

Do current codes of conduct, moral values, laws, and international agreements provide effective measures for SOCIAL JUSTICE? *

- yes
- possibly
- probably not
- no

The world's ecosystems are suffering from the burdens placed on environment by mankind's economic activities. Do you feel partly responsible for this? *

- yes
- possibly
- probably not
- no

Sustainable agriculture is achievable TECHNICALLY. *

- strongly agree
- agree
- somewhat agree
- somewhat disagree
- disagree
- strongly disagree

Sustainable agriculture is achievable ECONOMICALLY (e.g. through economic incentives, subsidies, etc.) *

- strongly agree
- agree
- somewhat agree
- somewhat disagree
- disagree
- strongly disagree

Sustainable agriculture is achievable ECOLOGICALLY. *

- strongly agree
- agree
- somewhat agree
- somewhat disagree
- disagree
- strongly disagree

Sustainable agriculture is achievable through SOCIAL CHANGE (e.g. politics, regulations, etc.) *

- strongly agree
- agree
- somewhat agree
- somewhat disagree
- disagree
- strongly disagree

Which of the following is the most important for sustainable agriculture? *

please tick 1 box

- scientific research and development
- investment
- infrastructure development
- education
- interest from society
- removing of subsidies and trade barriers

What would most effectively encourage a move towards sustainable agriculture? *

tick 3 items

- careful balancing of long-term and short-term goals
- technological change
- maturity, empathy, wisdom of people, i.e. change in the mindset of people
- education and higher awareness about negative implications of development on life
- local farming communities support
- positive relationship to nature
- more extensive findings in the area of science and research
- more effective international agreements and cooperation

Sustainable agriculture will be successful only to the extent that it is profitable. *

- agree
- undecided
- disagree

I perceive sustainable development primarily as: *

- an ideology
- means for achieving certain goals
- means for ensuring planetary survival

Submit